

MOTOR AGE

Vol. XXVIII
No. 20

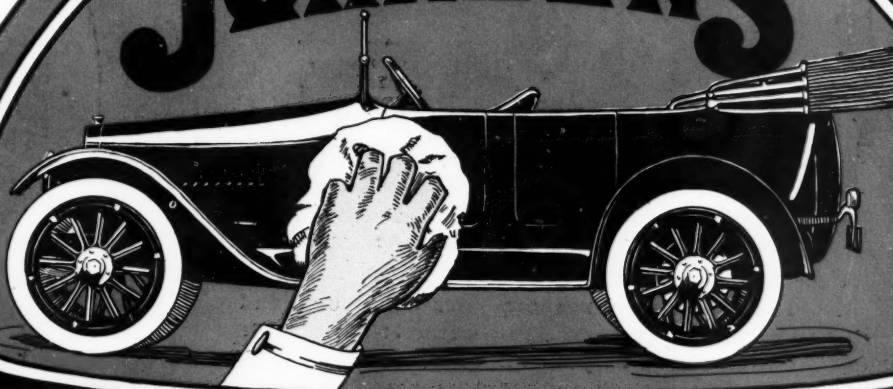
CHICAGO, NOVEMBER 11, 1915

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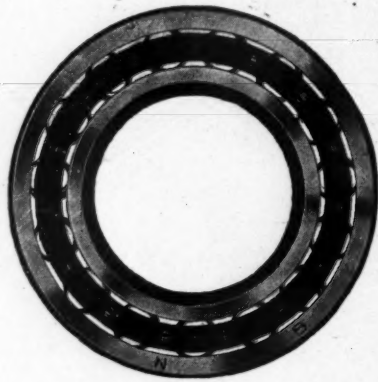
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November 11, 1915

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—NEXT WEEK—

"Speedway Records of 1915 in Retrospect," the feature of Motor Age for November 18, will portray the struggle for supremacy on the country's various ovals and will be unique in that it will place in the annals of speedway racing a history of events in which more records for speed-conquering will be given than in any other one year since this class of sport began.

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¶ Let us help get your advertising out of the way before the holiday season—before the coming automobile shows and before the press of business which comes at the first of the year.

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MOTOR AGE

American Ambulance in Its Work on French Battlefields

Seventy-Four Thousand Wounded Handled in a Year—Motor Car Merits Exemplified

By W. F. Bradley

PARIS, Oct. 10—Since the American ambulance was opened at Neuilly, in the suburbs of Paris, last August, the motor corps attached to that establishment has transported 74,000 wounded from the battlefields to Paris. The greater portion of this work has been done by Ford ambulances. The American ambulance keeps a large fleet of Ford cars in the field and in addition has a number of European cars which are used mostly for carrying wounded from the trains to the various hospitals in and around Paris.

One effect of the war has been to popularize the motor car on a scale impossible under peace conditions. In greater or less degree throughout all European countries the initial cost of a motor car is higher than in America. If account is taken of the purchasing ability of the natives, the difference in cost of a car in Europe is 100 percent greater than in America. Because of this, there are vast masses of Europeans who must look upon the motor car purely as a luxury, and in consequence maintain a certain animosity towards a vehicle which is and is likely to remain out of their reach. The war has changed that. For military purposes it has been necessary to teach thousands of men to drive army trucks. England alone has 20,000 drivers in various parts of the continent. It is estimated that France has 30,000 drivers in war service. These men have been drawn from all classes of society and represent every

trade and profession. Many of them had no connection with motor vehicles before the war began.

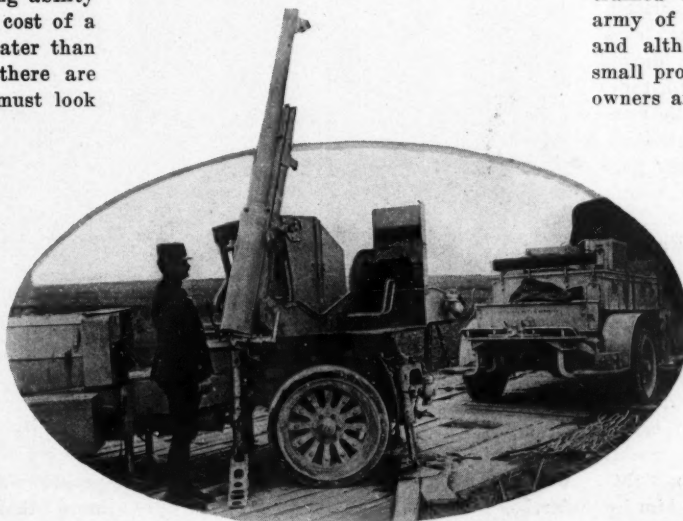
In France the rule is to consider a man's military training of primary im-

portance and to look upon his motor experience as a secondary matter. Thus, all the younger men of high military value go into the firing line, while the older men, or those of lesser military value, are trained to motor service. Thus, a vast army of new motorists has been created, and although it is obvious that only a small proportion of these men can become owners after the war, they will all retain motor car sympathies.

The army having called the best of the nation's manhood, it has been necessary for thousands of civilians to learn to drive. Motor schools are busier at the present moment than at any period in their history. The clients are owners, unable to secure the services of a chauffeur; men who want to take up driving as a profession; reservists expecting the army call, who would prefer motor work to guarding prisoners or standing by a bridge or railroad; women who for-



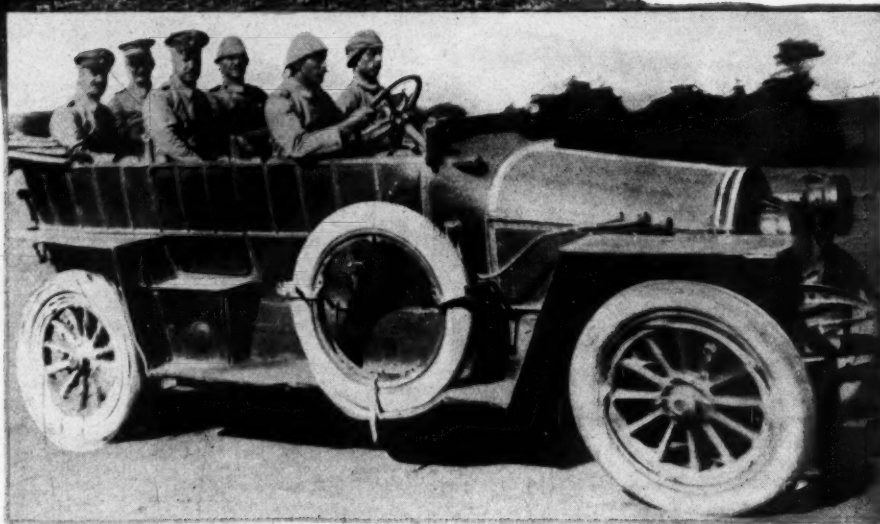
After delivering fresh meat to troops on the firing line Paris motorbus comes to village pump for a wash



Aeroplane gun mounted on truck



Above—Mechanical transport vehicle used by Germans in Russia, where roads are anything but good, for hauling loads of great weight



Left—Duke of Mecklenberg, who is fighting with the Turkish army, as he appeared while driving to the theater of war at the Dardanelles

merly were driven by a paid chauffeur or male relatives. Women drivers were uncommon in France before the war; now they are seen everywhere, on every kind of machine from an ancient one-lunger to a costly limousine. Before the war France had 100,000 privately-owned touring cars, and Great Britain 130,000. Including motorcycles and all kinds of commercial vehicles, it can be estimated that there were 250,000 self-propelled road vehicles in France and 350,000 in Great Britain. There were always more drivers than cars, but the increase has been so great during the war that it can be estimated there are now 2,500,000 Frenchmen with some driving experience and 3,500,000 Britishers who have at some time or other paid for a government driving license.

Several Million Learn Motor

Several million armed men in England and France have been brought in contact with the motor vehicle and have learned to appreciate it. For the soldier it has become as common a means of conveyance as the train, and a much more popular one. The improved living conditions of men in the field is due almost entirely to motor cars, and the men know it. Food, water, clothing, ammunition—everything a fighting man can require—is brought to him by motor car. When the period of duty in the trenches has come to a close, cars specially



The cookshop at the front, which is attached to a motor convoy and cooks the meals whether standing or on the move

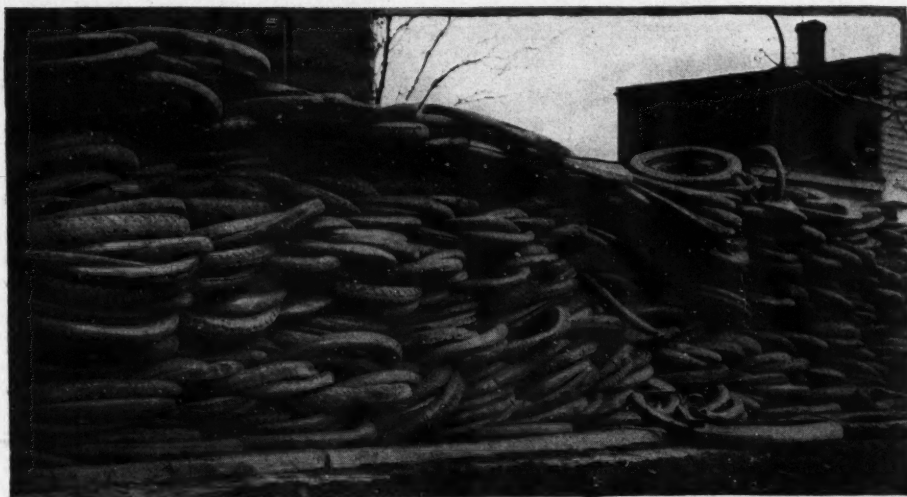
equipped for this purpose carry the men farther to the rear than would be possible with any other means of locomotion. The farther they can be taken to the rear during the rest period the greater the comforts that can be provided them.

How many thousands have appreciated the life-saving qualities of motor ambulances, it is difficult to estimate. It only is necessary to stand in a base hospital town, when the trainloads of wounded come in, to be impressed with the value of the motor ambulance. The cars rush through the town toward the railroad station at top speed. The return to the hospitals is different. If the load consists of men with slight body wounds, a brisk pace is maintained, for time is valuable, but if the driver has two or three serious stretcher cases, he will cut his speed down almost to that of a horse-drawn rig, he will drive on the trolley car lines, he will avoid pot holes and go over the rough

places at a crawl. It is possible to form a good estimate of the severity of the wounds by the way in which ambulances are driven towards the hospitals. The civilian, watching such a procession, with the knowledge that some of his own friends or relatives may be in the ambulance, is consciously or unconsciously impressed with the value of the motor vehicle. If a place is taken among the subdued crowds, which gather around the hospital doors when wounded are brought in, expressions of approval can be heard as silent, well-sprung, comfortably equipped ambulances draw up before the entrance. And when, at rare intervals, an old-time horse ambulance jogs up the path, there are murmurs of surprise that soldiers cannot be given something better; something more modern.

Parisian Proud of Motor Buses

The average Parisian, although he regrets having to walk, is proud of the fact that his city motor buses are at the front; he attaches an exaggerated importance to the role played by the city taxicabs in the battle of the Marne; a few armored cars going through the streets attract as much interest as a regiment on the march. The people who saw in motor cars nothing more than speed-possessed, dust-raising, mud-flinging machines unconsciously have lost their prejudices. The war has con-



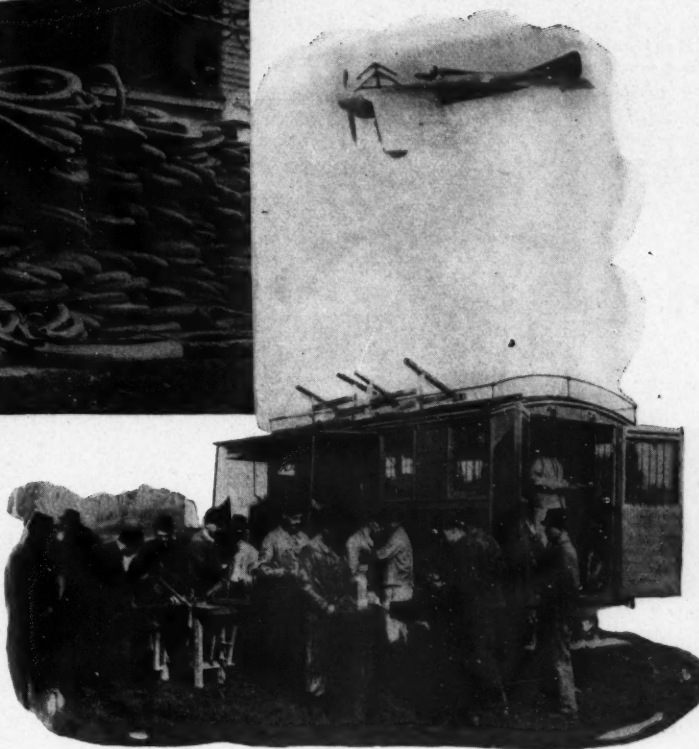
Old tires which find their way into England, sometimes as many as three carloads a week

verted all Europe to the motor car. It is a conversion which will have to be counted with when peace again is assured.

Aeroplane Scout Duty

Scattered up and down various parts of the British front in France, from the North Sea to Arras, are a number of Pierce-Arrow 5-ton trucks engaged in the interesting work of bringing down or scaring away enemy aeroplanes. Most of the trucks are armor-plated and carry a specially-designed, quick-firing, high-angle gun, which has put fear into the hearts of Boche pilots. The armored trucks are more than efficient fighting machines: they serve as comfortable living quarters for two of the men forming their crew. Although a five-ton truck possesses a platform of important dimensions, unoccupied space becomes limited when a gun, rifles and ammunition have been taken aboard. Despite this, the men manage to find space for two beds—without mattresses—on which they can lie full length. The five-ton trucks with standard army body and tarpaulin cover shutting it in on all sides,

Making aeroplane repairs at traveling machine shop on French battlefield. Airship scouting is seen above



makes an ideal bedroom. Within this, three folding hammock-beds can be slung, and if an air pillow is obtained, the height of comfort has been secured. In the various depots and headquarters no man will sleep in a house or shed if a truck and hammock are available. The dining table generally consists of a few planks laid on a couple of gasoline cases outside the car. When weather does not permit of eating in the open, the table is spread within the car, the quarters being made as comfortable as possible.

To relate all the doings of the Pierce five-tonners would be to give the history of the war in their particular district.

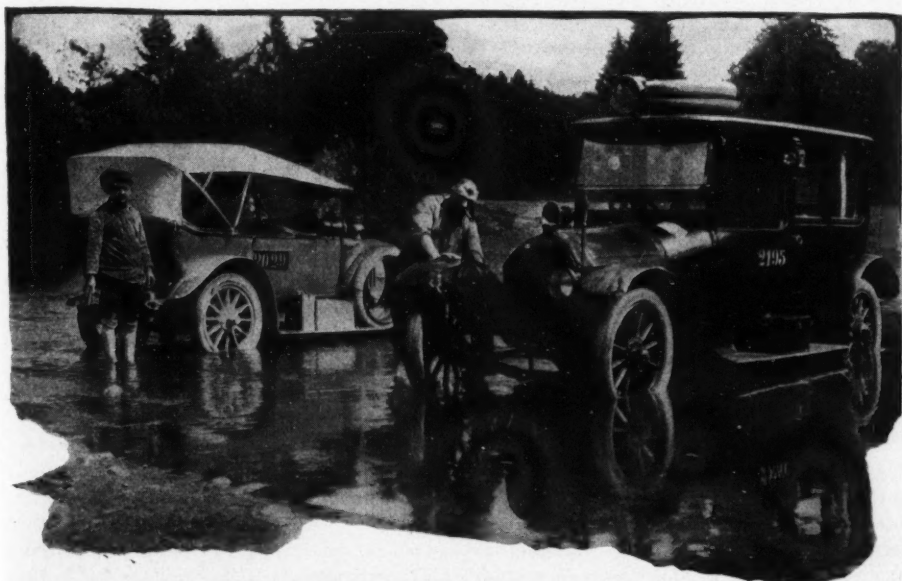
The following are a few of the incidents related by a driver serving with the corps:

"One of the most thrilling incidents happened during the first German gas attack in May of this year. Owing to the effects of the gas the French line broke and our own was so much exposed that it had to fall back to prevent defeat. News was brought us at the depot that one of the field pieces had been abandoned, but had not then fallen into the hands of the enemy. All the horses had been killed and attempts to get up with fresh teams had failed owing to the enemy's fire.

Volunteers to Bring in Gun

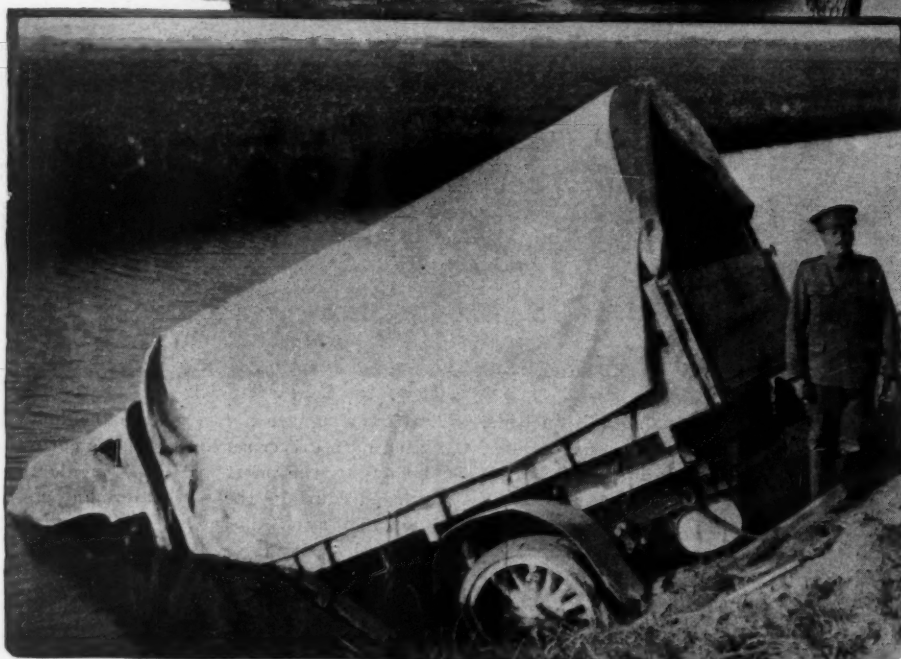
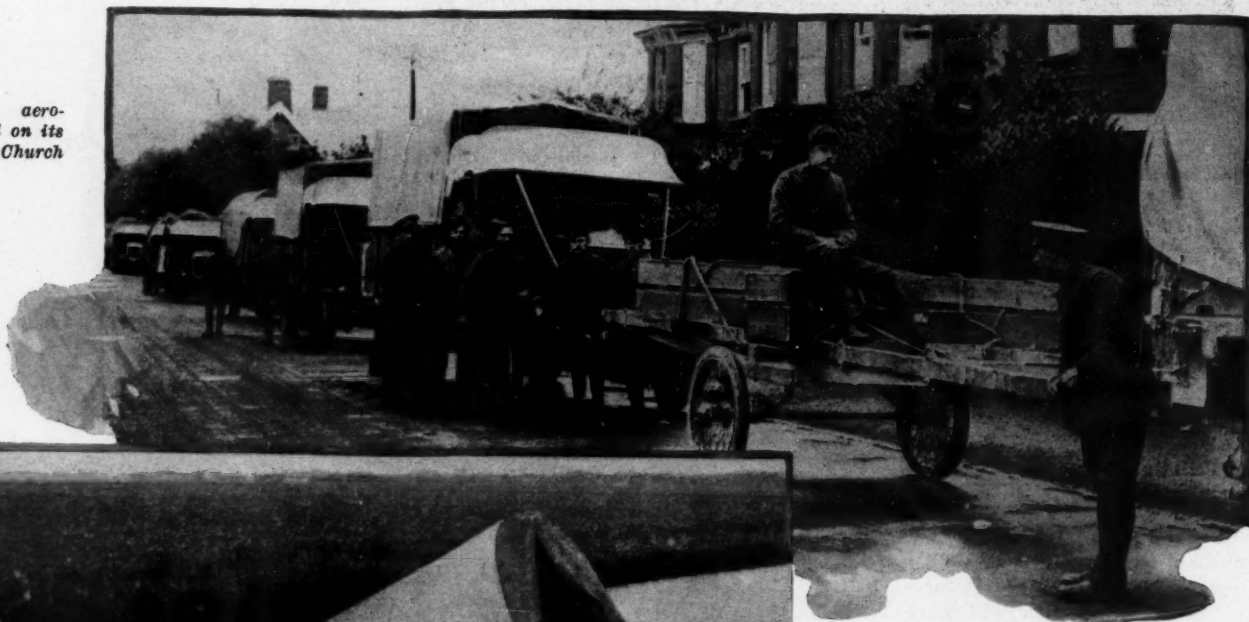
"On receipt of this news we volunteered to go out with one of the Pierce armored 5-ton trucks and bring in the gun. The armor-plating made us proof against rifle bullets, but we were susceptible to shells. Our own men were falling back as we worked up toward the gun position, and on nearing the front dead horses lay about and the countryside was scattered with abandoned rifles and equipment of all kinds. We backed in towards the gun position, getting as near as possible without attracting attention. Then three men went forward to fix ropes to the gun to enable us to haul it out. While they were doing so the enemy started shelling again. The men got what natural shelter they could until the storm was over, then went on with their work.

"When the ropes had been fastened to the gun carriage the afternoon was drawing to a close and it was decided to wait until dark before attempting to get the



French military chauffeurs washing their cars in a brook in the Argonne

English aero-
plane squad on its
way to East Church



Staff Sergeant Granville Pollock, an American, serving in the British army, by side of 5-ton Pierce-Arrow truck which has fallen in canal near Dixmude, Belgium

gun away. We were successful in this, and, having got the gun on the road, we fastened it close behind the armored car for the trip home.

A Perilous Trip

"This run of about 12 miles was one of the most trying parts of the affair. The fear of a further German advance had been averted by the action of the Canadian troops, but with darkness hundreds of our gassed men had come on to the road and were making their way to the rear. No light whatever had to be shown, for this would certainly have drawn the enemy's fire. The poor fellows suffering from gas seemed to be all over the road. We took as many of them aboard as possible, thus forming as strange a load as a motor vehicle ever carried. There was so much danger of running over helpless men in the dark that our lieutenant decided to walk in front of the truck and clear the road. He carried an electric torch, which he flashed near the ground from time to time, and called to us to stop when he found an obstruction on the road. In this way we traveled 12 miles,

most of the time having to run on low gear.

"One of the most difficult of the many break-down jobs we have had to handle occurred when a 5-ton unarmored Pierce truck dropped into the canal near Dixmude. The road here is a main one, dead straight, with the canal running parallel with it and separated from it only by a bank 2 or 3 feet high. Two staff cars, approaching at high speed, struck one another and were wrecked. The driver of the Pierce, who was close by at the time, suddenly found the road blocked and in an endeavor to avoid the wreckage used his brakes and steering wheel in such a way that he went over the bank into the canal. The motor hood and driving seat went entirely under water, while the rear wheels were half submerged. It would not have been a very difficult matter to get the truck back to the road if we could have fixed up the necessary tackle and made use of the whole of the highway. But this road was one of the main highways to the front, carrying a constant stream of traffic of every possible kind.

"It would have been preferable to lose the truck entirely, rather than hold up the traffic for even an hour. By properly grading the bank and planking it, we were able to get a fairly easy path up which we could drag the drowned truck. Ropes were fastened to the tow hooks and two other Pierce trucks set to the task of hauling the five-tonner up the 15 feet of embankment, for the canal is considerable distance below the level of the road. After a couple of hours' work, hauling inch by inch, we succeeded in getting the truck on the top of the bank; a platform was built to lower it on to the road and it was towed home without incident.

"This truck still is in active service. There was nothing to do to the motor other than clean it and dismount the magneto and carbureter. The steering gear was damaged and the tires suffered some in the accident, but these were soon put right."

Gasoline Shortage in Paris

From the first time since the war Paris has experienced a real shortage of gasoline. Recently supplies have failed to reach the retail dealers, many of whom have ceased to supply customers, while others refuse to sell more than 1 gallon to any one person. The correct explanation of the shortage appears to be that vast supplies have been requisitioned at the various refineries by the military authorities. This is not surprising in view of the enormous aeroplane activities of the French, and the possibility of an advance, which will, of course, throw greater work on the motor transport department. The recent attacks in the Champagne and Arras districts have been responsible for a great increase in gasoline consumption by reason of the thousands of trucks employed in carrying ammunition to the guns, in moving troops, and in clearing away wounded. It is obvious that the military authorities will lay hold of



English shopgirls shame the slackers, being taught ambulance drills as well as fire fighting

greater reserves than usual in view of the present attack becoming general.

The average retail price of gasoline around Paris—excluding the city of Paris, where there is a special tax—is now 42 cents per gallon. Some dealers are selling at 45 cents per gallon. Three years ago the average price



English tommies eating dinner outside a Pierce-Arrow armored car in northern France

was 27 cents, and just before the war gasoline was sold around Paris at 33 cents. There has been no additional taxation during this period. Benzol, which was largely employed for commercial vehicles, taxicabs, and by manufacturers for chassis testing, has been unprocurable since the war, all supplies having been requisitioned for making explosives.



English army en route to Belgium. Machine guns mounted on light motor trucks

MUNICIPAL GARAGE BREAKS EVEN

Cleveland, O., Nov. 9—Cleveland's \$450,000 municipal storage yard for motor cars at Rockwell avenue and East Third street may make all of four-hundredths of 1 per cent profit this year if the weather remains good and motorists see fit to leave their cars there. It will thereby take rank financially with the now deceased angleworm station at East Ninth street, and farming operations at Warrensville.

Service department records showed that from January 1 to September 1 a total of 10,263 cars had been parked in the yard. At 15 cents each, the income has been \$1,539.45. The end of the year is expected to see a total income of \$2,000, but from this amount must be subtracted the pay of the \$1.50-a-day keeper since June 1 and a portion of the \$60, \$65 and \$100 monthly wages of three men who put in part of their time tagging cars.

Blame Anti-Glare Law for Accidents

St. Louis Accessory and Insurance Men Claim Ordinance Defeats Its Purpose

ST. LOUIS, Mo., Nov. 6—Motor car interests, especially accessory and supply dealers, are making loud and bitter complaint against the St. Louis anti-glare headlight law which they say is responsible for a decrease in their business as well as for the unusual number of accidents which have occurred in this city since the dimmer ordinance went into effect.

The wholesale arrests of motorists whose lights did not comply with the new law, the accessory men say, have so frightened the owners of cars that many, ignorant of the exact requirements of the law, are operating their machines with dim lights, dash lights and in many cases without any lights at all.

To this they attribute the fact that the total of deaths caused by motor cars during the current year has been brought up to 55 and the injured to approximately 300 during the past few weeks. Last month alone, twelve persons were killed by cars here and nearly a hundred injured.

Insurance men have joined hands with the accessory dealers in condemning the ordinance which prohibits the use of lights whose rays are more than 3 feet above ground at a distance of 75 feet in front of the car. Companies, which have placed liabilities insurance on cars, have been besieged during the last few weeks as never before with claims for injury to persons and machines alike.

Law Defeats Purpose

The law defeats its own purpose, in the opinion of the insurance and accessory men. It was adopted in the belief that dazzling headlights bewilder pedestrians and motorists coming from opposite directions. On the contrary, opponents of the law argue, glaring headlights warned pedestrians of the coming of a car when the machine is yet in the distance while by the new arrangements, the pedestrian does not realize the approach of danger until the machine is almost upon him.

Motorists themselves, in addition to inconveniences caused by the ordinance, complain that being accustomed to driving at a speed which was safe during the use of bright headlights, it is now difficult to become accustomed to the slower speed.

Some blame for the present situation has been cast upon the officers of the Automobile Club of St. Louis who endorsed the headlight ordinance. P. D. C. Ball, Federal League baseball magnate and prominent member of the club, has sent a formal protest to the club against the support given the new ordinance.

"I consider the enforcement of the headlight ordinance to be directly responsible for the epidemic of motor accidents now occupying public attention and

I believe that most of the accidents which happen after nightfall are directly attributable to the headlight regulation," Mr. Ball wrote.

BAY STATE LAWS ATTACKED

Boston, Mass., Nov. 6—Massachusetts laws again are being invoked to add to the burdens of the men who sell cars and accessories. At Boston there is a case pending now before the superior court on the right of a legitimate dealer to sell a car he has taken in trade. The Boston police department recently notified the used car dealers that they could not sell a machine they bought second hand in less than 30 days from date of purchase. Boston dealers in new cars also were notified that they must take out licenses as second-hand dealers, but they refused to obey the mandate. As a result, the police started to make a test case and had a dealer arrested. The police contend that the law says that every used article, including motor cars, must be held 30 days in order to give the force clues to stolen articles. The pawn brokers must report every article pledged with them, and the motor dealers are to be put in the same class.

At Springfield, Mass., last week Elton C. Smith, clerk in an accessory store of Judson M. Strong, was in court before Judge Heady charged with making a sale on Sunday. He was found guilty but his case was continued from day to day on the promise that the store would not be opened on Sunday in future.

According to the interpretation of the judge, no garage proprietor may sell gasoline, tires or accessory parts on Sunday. Under that ruling if a motorist runs out of gasoline or blows out a tube or tire and has no extra, he is stalled where it happens even though he is next door to a garage. The Springfield motorists plan to take the matter up with the motor organizations in an attempt to have the law remedied, for if enforced all over the state, it will mean much trouble for motorists and a loss of business to garage owners.

STEVENS-DURYEA TO REORGANIZE?

Springfield, Mass., Nov. 6—There are persistent rumors that Stevens-Duryea cars will be manufactured again as a result of negotiations that are in progress for the sale of the Olmstead and Tuttle factory, situated off Springfield street. James L. Doherty, trustee of the estate, admitted that negotiations are under way for the sale of the property, but refused to say who the prospective buyer was. Officials of the New England Westinghouse Co., which bought the Stevens-Duryea

plant, stated that they were not looking for any other factories at Springfield, so the talk about the Stevens-Duryea reorganization became current again.

The company still has its plant for manufacturing parts to supply owners, but it is not large enough for manufacturing purposes, but the Olmstead and Tuttle factory would give it the needed facilities. According to current reports, a new charter will be applied for and work started on 1916 models with new capital furnished by others not identified with the old company. Some of the dealers who handled the Stevens-Duryea in large cities, like J. W. Bowman, the Boston distributor, feel that the cars could be marketed since the Packard has gone into the twin-six field with a new price list.

Bowman was asked a few days ago if he heard anything about the resurrection of the company, as he was closer to the officials than about any other dealer, but his reply was non-committal, being: "Stranger things have happened." The fact that he dropped the Maxwell in Boston is taken as an indication that he is one of the men behind the reorganization plan, for it is known that he could raise capital for a new company in Boston.

CHALMERS STOCK TO PAY \$12

New York, Nov. 6—The Chalmers Motor Co., Detroit, which has been paying at the rate of \$10 a share annually on its common stock for the past 4 years, will start the year 1916 with an increased rate. The new basis, it is understood, will be \$12 a share annually, or at the rate of \$3 quarterly. The increase will start in January and will be due to enlarged production and earnings, profits so far indicating a surplus for the current fiscal year equal to \$30 a share on the common. The stock is \$100 par value and is selling at 160. In August, 1910, the company declared a stock dividend of \$900 a share. In October, 1912, another stock dividend of 33¼ per cent was declared, followed in June, 1913, with another stock dividend of 25 per cent.

SERVICE MANAGERS ORGANIZE

New York, Nov. 6—Upon his return from a trip through the west, Alfred Reeves, general manager of the National Automobile Chamber of Commerce, announced the formation of the Automobile Service Managers' Association of Michigan, with headquarters in Detroit, and to have as members the service department men of the motor car concerns in Michigan, northern Ohio and western Ontario.

The purposes of the association are to promote personal acquaintance among the representatives of the service and repair parts departments of motor vehicle manufacturing companies; to consider the best methods of conducting the work of service and repairs; to promote the adoption of the most liberal policy of helpfulness to purchasers of motor vehicles, and to gen-

erally improve and facilitate coöperation among manufacturers, dealers and owners, with a view toward supplying the maximum of service to the mutual advantage of all.

Meetings will be held every month, at which papers on the problems of service will be read and discussed, with lectures and moving pictures of men and machines in factories and their operations.

The Indianapolis service managers already have been organized, and associations will be formed in Chicago and probably in Cleveland.

At the Detroit organization meeting, a constitution and by-laws were adopted, and the following officers elected for the ensuing year:

President, C. R. Lester, Packard; vice-president, E. P. Rippengill, Hudson; secretary-treasurer, E. H. Hazelton, Regal; executive committee: J. L. Kenyon, Cadillac; H. O. Weisse, Oakland; H. G. Fitch, Overland; C. W. Matheson, Dodge; Charles Gould, Maxwell, and Pierre Schonn, General Motors Truck.

STUDEBAKER EARNINGS \$10,000,000

New York, Nov. 6—Earnings of the Studebaker Corp. for 1915 will fall slightly short of reaching the \$10,000,000 mark, compared with a surplus for 1914 of \$3,752,916, after allowing a charge-off of \$402,698 for extraordinary expenses. On the \$27,931,000 common stock now outstanding, these profits work out a per share surplus this year of somewhat over \$30, compared with a trifle less than \$15 last year. The larger part of this earning power of between \$9,000,000 and \$10,000,000 is from domestic business entirely.

Last week was a record one, with shipments of 1,510 cars, and October was the record month, with shipments of 6,009 cars. All these machines were for domestic consumption. The company is doing an excellent export business to South and Central America, Australia and the Far East. Its domestic demand, especially in the east, has been very heavy, as the sales in Boston, Philadelphia and New York in the past year have doubled.

SENTENCED TO BUY SPEEDOMETER

Los Angeles, Cal., Nov. 9—The campaign against speeding being waged by the officials of Los Angeles, city and county, has resulted in a tremendous increase in the business of speedometer merchants. The officers have orders to hold motorists to 20 miles in the city and 30 miles on the county highways. Out of 500 arrests in the last 3 weeks more than half have attributed their misfortune to inaccurate speedometers. Many old speedometers are incorrect, but the officers have had to contend with so many doctored speedometers that such an excuse is regarded as a joke and the judge usually advises a new speedometer with the sentence.

Boom for Guayule Rubber Industry

Americans Buy 10,000,000 Acres of Land and Plan Tire Factories in Mexico

TORREON, Mexico, Nov. 8—If circumstances and outward indications count for much, the guayule rubber industry is on the verge of the greatest boom in its history. Immediately following the announcement that the United States had recognized Carranza and his de facto government, the American representatives of a number of large syndicates flocked into this part of the country and began purchasing leases on guayule producing land. Many such leases already had been entered into with the owners of the land while the latter were refugees in the United States.

It is estimated that not less than 10,000,000 acres of land upon which the guayule shrub grows profusely have been leased to Americans during the last 2 weeks. In some instances the land was leased in solid areas of 1,000,000 to 2,000,000 acres. The leases only cover the guayule shrub, and do not interfere in any manner with any other uses to which the owners of the land may wish to put their respective properties. The guayule producing region is confined principally to the highlands of the states of Coahuila, Durango, Zacatecas and Nuevo Leon.

Preliminary to Rubber Factories

It is stated that this rush to obtain leases on land for the use of the guayule shrub that grows thereon is preliminary to the establishment of a number of new rubber factories in this section. In fact, it is known that the building of two new factories of this character will soon be started in Torreon. In both instances, the principal stock will be held by American tire manufacturers, it is stated, and T. F. Oberton, of Detroit, Mich., and Frank Serrenth, of Indianapolis, Ind., are here arranging for construction of factories.

The guayule rubber industry had attained large proportions at the beginning of the revolutionary period in Mexico 5 years ago. The value of the guayule rubber exports from this country then had reached a point that was second to the output of her minerals. The ownership of guayule shrub lands and of factories for the production of crude rubber was principally in the hands of what is known here as the Rockefeller-Aldrich syndicate, operating under the name of the Intercontinental Rubber Co. and its subsidiaries. This company has a \$5,000,000 guayule rubber factory in Torreon and several other factories in this region, and also is the owner of the Cedros ranch or hacienda, embracing 2,000,000 acres, situated in the state of Zacatecas. This big property is covered by a heavy growth of the shrub, much of which will give a yield of 2 tons to the acre, it is said.

Gustavo Madero and other members of that family also are largely interested in the guayule rubber business. A big part of their 15,000,000-acre estate is situated in the guayule growing territory. The Maderos owned and operated a number of factories for converting the shrub into crude rubber at the outbreak of the revolutions. Some of these factories will have to be rebuilt.

During the 5 years that the manufacture of guayule rubber has been greatly curtailed on account of the revolutionary disturbances, the cut-over lands have grown a new supply of the shrubs and the raw material is now in greater abundance than it was at the beginning of the industry. This is due also to the fact that large tracts of land that were seeded with guayule when it was found that the shrub was valuable now are covered with a bountiful crop of the ray material. Botanists and others have given considerable study to the guayule shrub.

GRAYDORF COMPANY ORGANIZED

Detroit, Mich., Nov. 9—Special telegram—The Graydort Automobile Co. has been formed in Chatham, Ont., Canada, taking over the Canadian Dort business. The capital stock of the new concern is \$500,000, of which \$300,000 is paid up. At the head of the company is Robert Gray, of the Gray-Campbell Co., and J. D. Dort, who has been president of the Dort Motor Car Co., Flint, Mich., for the last 2 years. The old Campbell plant has been taken over by the new company.

ARGO BUYS PLANT

Jackson, Mich., Nov. 9—Special telegram—The Argo Motor Co. is now the owner of the old Standard Electric Co.'s plant, which it has been occupying. It is expected that the manufacturing facilities of the company will be greatly increased, it being the intention of making 20,000 to 30,000 Argo cars for the 1916 season. At the same time this deal was announced, it also was stated that the Jackson Motor Parts Co., having a capital stock of \$210,000, has been formed principally to make parts for the Argo company. L. E. Latta is president and general manager of the new company.

CAR REGISTRATIONS INCREASE

Hartford, Conn., Nov. 8—Passenger cars in this state have increased nearly 8,000 up to this date. The registration figures are 32,786. Trucks number 4,565 as against 2,968 in 1914. The number of operators' licenses issued up to the present is 50,376 as against 36,746 before.



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Outdoor Dixie

BEGINNING with issue of November 25 Motor Age will commence its series of articles on Outdoor Dixie—what the motorist who goes into the southeast with his car during the winter can see. Since 1864, Dixie to many has been a land of yesterday, a land of cotton, of sugar plantations, but not a land breathing through every tissue of its structure the virile force that has made America what it is today. When the great tide of settlement moved west of the Mississippi instead of south of the Mason and Dixon line, the south was the loser.

TODAY the south is more in the national eye than it has been since the war, and Outdoor Dixie is more of a reality to the motorist than ever before. The Dixie highway conception should be a great force in linking the south to the north and central north. The conception is a national one, but it will remain in embryo unless the motorists, the good road advocates and the business men and business interests of the south get behind the conception and move it along into the realm of reality. Concepts are essential, but unless they become realities there is little permanent profit.

WITH the hope of bringing the concept of the Dixie highway closer to the margin of reality and with the hope of interesting the hundreds of thousands of American motorists in Outdoor Dixie, Motor Age will publish a series of articles on a few of those high spots of outdoor life in the southeast in which every motorist is interested; so that instead of our people seeking the pleasure veins of other continents in times of peace, they will learn

to love America more, and get better acquainted with her magic outdoor charms.

IN the November 25 issue of Motor Age, J. C. Burton, who has just returned from a trip over the western loop of the Dixie highway and through the southeast by motor, will start a series of travel articles on the south. His first contribution will be the story of St. Augustine, the oldest city in North America, a city that has the atmosphere of Seville and takes precedence over New York, Boston and Salem in the history of American settlements.

THE next article in the series will be the story of Charlestown, the city of yesterday where the history of the Revolutionary and Civil wars can be lived in the imagination of the tourist, a city without parallel in all the domain of Uncle Sam.

FOLLOWING will be published articles on the scenic and historic charms of the other outdoor centers of the south, the story of Savannah, the terminus of Sherman's march to the sea; of Augusta, the winter resort of Georgia; of Columbia, where the articles of secession were signed; of Asheville, located in the very heart of the most picturesque mountain country in all America; of Miami, magic city of Florida where the motorist may hunt alligators and fish for shark and tarpon.

THE south is a land of hospitality, rich in scenery and history. Read of its charms and you will not be content until you have seen it from the seat of your motor car.

Racing in 1916

LAST week's 100-mile invitation race on the Sheepshead Bay speedway demonstrated that there is more interest to the spectators in short races and in sprints of 2 or 4 miles than in 500-mile events or even 300-mile contests. The spectator has complained that the mental load of carrying the positions of the cars is too great in a 500-mile event with a field of thirty starters or even twenty starters. The motor-wise spectator may be able to follow the changing positions of five or six or even ten of the leading cars in a big race, but for every one of such there are a hundred or perhaps 500 who cannot do it and who find the mental burden of the long-distance race too great. True, the spectacle for the first ten or twelve laps is attractive, but it is not enough to hold the spectator for 4, 5 or 6 hours.

WE must cater in racing to the spectator who once a year sees a great motoring event. We must make racing easier for that man. He must understand the race, understand every move of it. A baseball game would be robbed of its greatest interest if every spectator did not know what player was coming to bat, what pitcher was in the box, what catcher was working and what umpires were at their posts. The instant after a ball is pitched the spectators know whether it is a ball or a strike. They do not have to wait until after the player is out. It is signaled immediately.

MOTOR racing can take a few chapters from baseball experience and from horse racing experience. A score of little things can be done that will make it easier for the spectator to follow the race. This must be done if the big grand stands at our speedways are going to be filled and filled twice or three times a year. The spectator will soon become as interested in speedway racing as in a baseball game. It is not necessary to have some noted baseball player hit on the head in each game to get the crowds. It is not necessary in racing to have some person killed each event to get the crowd. The crowd will increase if better posted each minute on the exact happening of the race.

RACES must be shorter. If it is necessary to have a 100-mile race have two, three, four or perhaps five short-distance races of 4, 6, 8 or 10 miles. These short-distance events will give more real competition than the 500-mile race. There is amazing interest in seeing two cars coming down the stretch radiator against radiator if it is at the end of a 2-mile race or any other race; but these two cars coming down the stretch in the same position at the end of a dozen laps in the first part of a 500-mile race scarcely give a thrill. In other words, we have in a 500-mile race a hundred or more incidents that pass without provoking a thrill but which in shorter races would bring the entire grand stand to its feet.

Coast-to-Coast Car Breaks Marathon Taxicab Record

Valet Service and Meals Are Supplied Tourists Who Hire
This Machine for Extensive Trips

OLNEY, Ill., Nov. 9—Transcontinental taxi service is a novelty in motor transportation which has been inaugurated in the United States by Alva E. Smith, of this city, who made his home in San Diego, Cal., for several years and recently served as director of chauffeurs on the police force there. Recently Smith conceived the idea of carrying tourists by car across the country and has found the business profitable, his car being in constant demand.

Smith charges 40 cents per mile where there are not to exceed six persons in a party. He attends to the driving but carries a valet who looks after the baggage, serves picnic luncheons and makes himself generally useful. At the end of a trip, Smith advertises his car for hire and goes wherever his patrons desire.

In discussing his new service, Smith said: "Tourists, prior to the war, spent millions each year in Europe, engaging cars for similar tours, and I cannot see why we cannot do the same kind of business here. Many, who own cars, find it more enjoyable to be relieved of all responsibility by employing me. I assume all risks for possible damage suits that might be started through accidents and also pay for the upkeep of the car. The only expense of the traveler is for the regular fare and the hotel bills. My valet, if the party is on a camping trip, can serve quite a delectable meal and he is a handy, all-around man."

Has Agents in Several Cities

Smith makes it a point to keep on good terms with every city he visits, conforming to all traffic regulations and learning all that he can about each place. He arranges trips for other motor car dealers for which he is paid a commission. He recently came to Illinois with a party from California and plans to go soon to French Lick, Ind., where he will pick up a party of tourists bound for Florida. He has engaged representatives in every important city in the country who co-operate with him in providing similar service for parties. Smith frequently hears of tours that he is unable to take care of and advises the nearest city of a proposed trip.

Eventually the business may become systematized and a chain of cars be placed in operation all over the country, thus permitting a patron to flit all over the United States in a taxicab like Smith's.

MOTORIZE MEMBERSHIP RACE

Worcester, Mass., Nov. 6—The officers of the Worcester Y. M. C. A. have devised a very original scheme to jump its membership at least 1,000 by forming competing teams, the captains and most of the members of which are identified with

the motor agencies in this city. A big map of the United States has been made and divided into mileage areas of 100 miles per section. Whenever a team gets five members, it is credited with 100 miles. The starting point is San Francisco and the finishing point is Worcester, and the mileage is placed at 900 between the two points, so to make the final goal a team has to secure 60 members. When the race started, there were 32 teams entered, and on the first day the Haynes and Ford teams romped away from the field, being credited with about 250 miles each because they had brought in twelve new members apiece. On the first day, 155 new members were added to the roll by the motorists. The run will continue a week and prizes will be awarded the winners.

IS MECHANIC A CHAUFFEUR?

Freeport, Ill., Nov. 9—The meaning of the word "chauffeur" and the duties of such an individual proved an important feature of a lawsuit in Freeport this week. Upon complaint of Ben Cochran, examiner from the office of the secretary of state, who has been making a tour of the leading cities, examining all candidates for a chauffeur's license, Arch Franks, em-

ployed as a mechanic at the garage of George W. Brokhausen, was arrested, charged with failure to procure a chauffeur's license.

The employer objected to the action and engaged a lawyer to defend Franks, maintaining that mechanics are exempt from such a test or license. Although it was proven that Franks had occasionally driven cars for his employer, he was really a mechanic. After spirited arguments by the lawyers, the jury retired, and, after an hour's deliberation, brought in a verdict of not guilty. Five other cases against mechanics were dismissed.

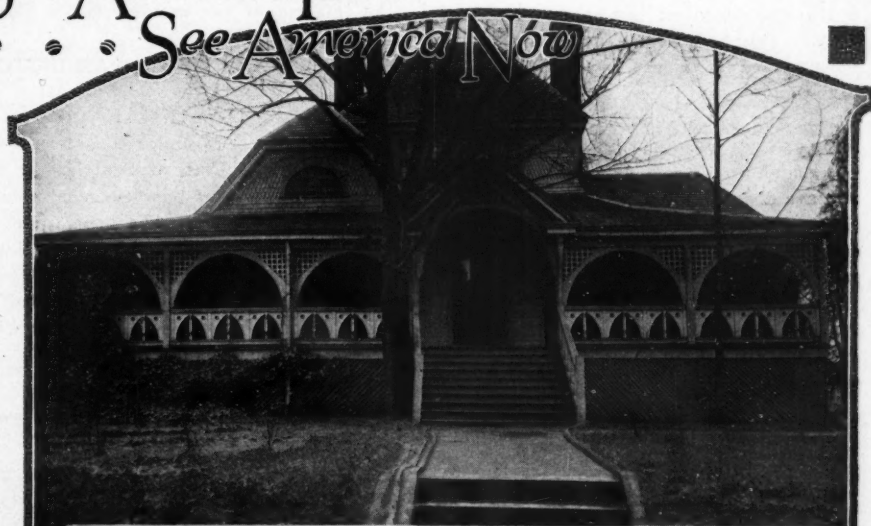
The action establishes an important precedent, as the state examiners have been insisting that all mechanics take the chauffeur's examination and pay the same fee.

THE SOURCES OF SPLENDOR

Through an oversight, Motor Age failed to give credit to Mandel Bros., Chicago, for the coats and hats shown in the fall fashion illustrations printed in last week's issue. The car used as a background is a 1916 Chalmers and the model's name is—but that makes "no never mind," as Joe Weber used to say to Lew Fields.

See America First —

• • • See America Now



THE term "Uncle Remus" has become synonymous with the name of Joel Chandler Harris, the American journalist and author, who began his career as a printer's apprentice at Forsythe, Ga., and who lives, at present, in Atlanta, Ga., in the building shown above, which he has seen fit to characterize as the "Wren's Nest." Uncle Remus has gained a national reputation through his sketches and songs and his many books. This home is just one of the many and varied points of interest that lie along the path of the Dixie highway and make for greater charms of touring in the Southland.

EDITOR'S NOTE—This is the fifty-second of a series of illustrations and thumb-nail sketches of scenic and historic wonders of America to be published in Motor Age for the purpose of calling the attention of motorists to the picturesque points of interest in their own country.

Garages Result of War

War Stocks Enrich Citizens of
Wilmington, Del.

Public Spaces for Cars Spring Up
Like Mushrooms

WILMINGTON, Del., Nov. 9—There has developed in Wilmington such a mania for occupying almost all of the available space for groups of small public garages—an indirect result of the war in Europe—that the city authorities have found it necessary to restrict the construction of garages to a distance of 40 feet from a neighbor's property, except with the consent of the latter. However, it has not been difficult to obtain these consents, except in a few instances, and groups of small garages, resembling rows of chicken coops in some instances, are to be found all over the city, chiefly in what would otherwise be back yards or alleys, and the end is not yet.

Wilmington is one of the American cities that has profited immensely by the war in Europe. The Dupont, Hercules and Atlas powder companies have their headquarters here, the first named having local works employing nearly 20,000 persons. Many of the employees from time to time have been given stock or were permitted to buy on the ground floor when new issues were put out. As the stock has been soaring for the past year, having gone from 90 to 800 in 6 months, many of the company's employees, as well as other residents who obtained the stock, have been greatly enriched, and in nearly every case these riches have been applied to the purchase and operation of motor cars. Hundreds, who never thought of motoring before, as they were working for small salaries which would not permit of this pleasure, are ardent motorists now, for, in addition to profiting by their stock, the company voluntarily increased their pay 20 per cent and is paying large bonuses.

The principal visible results of this heaping of riches upon an army of working people is the advent of about twice as many motor cars as Wilmington could

boast of before the war started, and also the erection of a large number of homes for workmen who heretofore could do nothing more than pay rent.

As an instance, a few years ago a young girl, just out of school, with no means at all, obtained employment as stenographer in the office of one of the officials of the Dupont company. She proved faithful and a valuable employe, and in recognition of this was presented with a few shares of stock. She was married a few weeks ago, retiring from the company's employ with a fortune of \$50,000 and her stock intact.

WILL RECRUIT MOTOR RESERVES

New York, Nov. 9—A letter has been sent out by the New York State Motor Federation to all affiliated clubs to ascertain if a majority of the federation units is in favor of the motor reserve corps. The letter is signed by John M. Ross, president, Utica, N. Y.

"We would like to be the first motoring organization to get back of this movement," said Mr. Ross. "As soon as the federation approves, we will immediately announce that each of our clubs will act as recruiting stations for enrollment in the A. R. C. We now have club offices in Jamestown, Buffalo, Rochester, Syracuse, Rome, Utica and New York City."

A similar canvass is being taken of motorists in Philadelphia by the Automobile Club of Philadelphia.

Captain Lorillard Spencer, military secretary to Governor Whitman, of New York, is now arranging details of the mass meeting of motorists to be held here in the interest of the motor reserve corps.

MOTOR CORPS FOR WASHINGTON

Seattle, Wash., Nov. 9—Formation of a motor reserve as a link in the national chain of defense is under consideration by the Automobile Club of Seattle. A committee of prominent business men, who are members of the club, has been appointed to consider the matter. If such a reserve squad is formed, it doubtless will be under the direction of the national guard of Washington, as there is no means by which such an organization can be taken over by the national government.

Show Is Held in Tent

California Used Car Exhibit
Under Canvas

Los Angeles' Novel Attraction
Draws Many Spectators

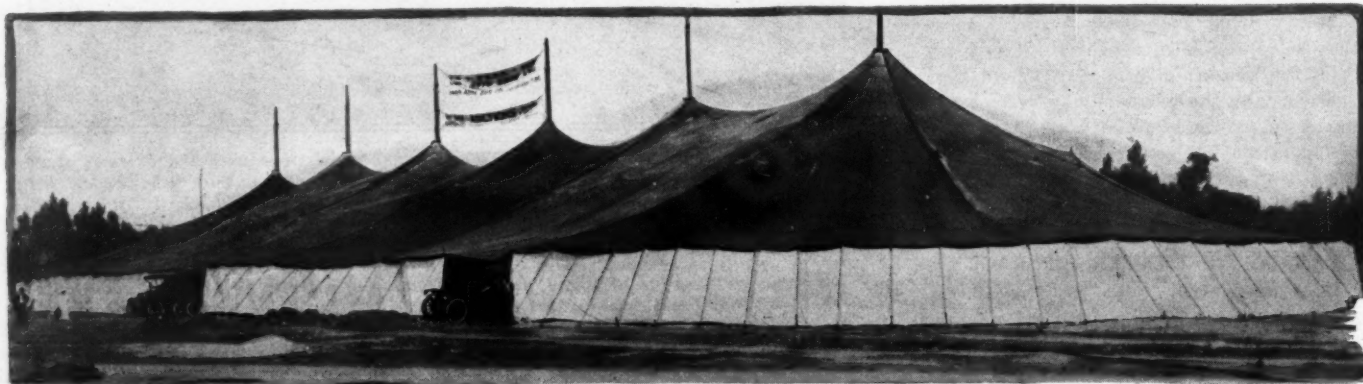
LOS ANGELES, Cal., Nov. 4—The largest tent in the world houses the latest novelty of the motor industry established in Los Angeles. It is a used car show. The tent has a capacity of 5,000 persons and 500 cars and is used for the purpose of displaying for sale and exchange the largest supply of cars ever housed under one roof.

For many months there has been a great used car business carried on within a short distance of the heart of the city on vacant lots. Realizing that this business would suffer from the winter rains and that there is a great deal of business to be done after dark, the Union Auto Bus Co., a California corporation with a capital of \$75,000, erected the great tent and is operating the used car show, auctions, sales and exchanges. Real estate also is exchanged for cars and cars for real estate.

Inside the main tent there is a large circular track for demonstrating purposes. There is also an elevated runway in the center of the track for testing brakes, gears and motors. This elevated bridge also will be used at the weekly auctions as the "block."

These auctions are to be held each Saturday. Cars are entered in the market place for the sum of \$1. This entitles the owner to display his car for 1 week with the price mark attached and enter it in the auction at the end of the week.

It seems quite natural that Los Angeles should be the first city to adopt this method of disposing of used cars, as there are more used cars in Los Angeles county than any other county in the United States and there are as many buyers, seemingly. It is a great fad in Los Angeles to purchase some old model touring car, say a 1911 or 1912 model, and have it rebuilt into a snappy roadster or raceabout.



View of the tent in which Los Angeles used car dealers hold their fall show

Raise Stop Thief! Cry

Kansas City Association in War on Motor Crooks

Record of Cars Kept to Make Possible Their Identification

KANSAS CITY, Mo., Nov. 8.—The New Anti-Motor Thief Association, organized and incorporated in Kansas City for the protection of motorists against thieves who steal motor cars and accessories, has chosen Frank E. Lott as president, Lawrence E. Smith as secretary and W. S. Webb as treasurer. The managing committee includes a representative from each of the following organizations: The Commercial Club, the Board of Trade, the Rotary Club, the Co-Operative Club, the Motor Club, the Automobile Dealers' Association, the Engineering Club, the City Club, the Insurance Underwriters' Club and other civic associations. The purpose of this comprehensive representation is to impress the police department and the courts, which are said to have been derelict in the apprehension, prosecution and punishment of thieves, of the power wielded by the association.

The association has made up the most complete program of precaution, looking primarily to the prevention of thefts, and secondarily to the catching and full punishment of thieves as well as the recovery of the stolen property. Each car owner is to have a special number on the records in connection with which is to be recorded the name and make of his car, the factory number, the number of his state and city license, the tank number and every other means of identification.

Makeup of Program

A man is to be kept on duty every hour of the day and night. He will be in charge of this record, so that when a machine is reported stolen, every police officer in the city may be apprised at once of the complete and detailed facts for the identification of the stolen car. Arrangements have been made to have every means of egress from the city guarded so that no guilty man may escape. An ordinance is now being framed, under the inspiration of the association, making it a misdemeanor for a man to buy or sell a motor car which has had the factory number taken off by any method and it is said the city council will pass it. Another ordinance, forbidding any second-hand dealer in motor cars or motor car accessories to live over or near his place of business, has been suggested but probably will not pass.

The association has a membership fee of \$3 per member and is getting a large list of members. There is a standing offer of \$100 reward for the arrest and conviction of a motor car thief and \$100 more for the arrest and conviction of a firm that sells stolen cars. The officers of the

association have secured the promise of the criminal judge not to parole a motor car thief without first hearing the side of the motorist from representatives of the association.

SELECT DIXIE BEE LINE ROUTE

Evansville, Ind., Nov. 6.—The official route of the proposed Dixie Bee Line highway was selected here yesterday at the executive session of the nineteen county vice-presidents from Illinois, Indiana, Kentucky and Tennessee.

It was decided that the proposed highway will run from Danville, Ill., to Terre Haute, Ind., passing through Clinton, Ind., and Newport, Ind. From Terre Haute, the highway will follow the state road south, passing through Sullivan, Vincennes, Princeton and Fort Branch to Evansville.

Twelve miles below Evansville, the highway will cross the Ohio river at Henderson, Ky., and from Henderson the road will proceed south to Madisonville, passing through Poole and Dixon. From Madisonville it will proceed to Hopkinsville, going through Earlington, Nortonville, Crofton and Morton's Gap.

From Hopkinsville, the road will go to Springfield, Tenn., passing through Guthrie, Ky., Pembroke, Ky., and Trenton, Ky.

ORDER PARTS; THEN STEAL THEM

East St. Louis, Ill., Nov. 5.—The very latest thing in "using the mails in a scheme to defraud" was disclosed here today by five Federal indictments which accused as many men—prominent in their communities—of ordering motor car accessories in Cleveland and Indianapolis, Ind., and then breaking into local railroad depots to steal the accessories addressed to themselves. This practice, it was learned today, has been going on successfully for some time before either the postal authorities or the victimized accessory houses even suspected that the men who ordered the supplies and those who stole them were identical.

The indicted men are John C. Miller, a wealthy farmer; his son, Tony C. Miller, and Logan Estes, all of Neoga, Ill., and William Royer and Isaac Flaherty, of Mattoon, Ill. The arrest of the quintet created considerable excitement, both because of the uniqueness of the scheme with which they are charged and because of their standing. The five were arraigned in the federal court here, pleaded not guilty and were released on \$5,000 bonds each.

Three charges of using the mails to defraud and one of stealing from an interstate shipment were preferred against Estes, and each of the others faces one count on each of the two charges. According to federal authorities, the men ordered \$400 worth of accessories shipped C. O. D. to themselves under assumed names. Then, when notified the goods had arrived, they would break into the depot, it is said, and take the accessories. The men vigorously denied the charge.

Club Aids Movieites

Southern California Body Points Out Roads

Directors Know Little of Country and Seek Assistance for Locale

LOS ANGELES, Cal., Nov. 5.—A new department has developed in the Automobile Club of Southern California through the fostering of the motion picture industry in this section of the state. Film play directors from the east, who know little of the country, are aided by the club in discovering new and suitable locations and directors, who have been in the service for a great length of time, often are unable to find the necessary location and call upon the motor club to aid them.

The touring information bureau of the club has made it a business for the past 15 years to know the exact location of every bridge, lake, wash and mud-hole in southern California. The demands made upon the bureau by the directors are unequaled.

If a director wants to know where he can find an old bridge with the center washed out, he calls the motor club. If a stream of water, a mountain with the brush burned away or deep cut through the road is wanted, the club is called on the phone or the director makes a personal visit to the touring information bureau.

No Task Too Big

One director, before starting on a feature film, called at the club recently and wanted to know what roads in southern California closely resembled those of certain sections of North Dakota. The club officials produced photographs of the North Dakota roads and accompanied the director to a spot in San Bernardino county which would pass for Dakota scenery without a question.

In one of the greatest films ever produced in this section, a director from the east staged one of the biggest scenes on a piece of the new state highway supposed to represent a road scene in Spain several centuries ago. The film was completed and released but the first night the great feature was shown in Los Angeles, a young college boy called attention to the fact that there were a lot of Fords in Spain in those days. The director had failed to erase the narrow tire tracks at the side of the paved road, a blunder which is estimated at thousands of dollars to the film company, as it makes the great production ridiculous.

The motor club officials also act as efficiency engineers for the movie directors. They furnish the proper designs for license plates on cars from all states and years and instruct in the traffic regulations enforced in the large cities throughout the country.

Buying Cars on Installment Plan Now Is Possible

Overlands and Willys-Knights Can Be Purchased by Monthly Payments to Guaranty Securities Co.

TOLEDO, O., Nov. 8—Dealers selling Overland and Willys-Knight cars are now offered facilities for financing time payments on cars by a new securities company in this city, known as the Guaranty Securities Co. A guaranty plan has been worked out whereby the burden of carrying installment paper is removed from the dealers' and distributors' shoulders and carried by the Guaranty Securities Co. Three distinct kinds of discount facilities are afforded the dealers by the new plan, namely, the discount of installment notes on retail sales, the discount of farmers' notes on retail sales, and the discount of paper growing out of sales at wholesale by distributors to dealers, with particular reference to the winter stocking season.

In the working out of the plan, the Willys-Overland Co. has advised and suggested a course which would benefit Overland dealers, but the Willys-Overland Co. is not in any way connected with the Guaranty Securities Co.

It is a method which will undoubtedly effect a great change in the selling of Overlands, for by its provisions, any dealer is in position to sell a man a machine of any model manufactured by Overland on a time basis. The buyer, of course, must be a responsible party whose notes will be good security.

Guaranty Plan Outlined

Briefly, the guaranty plan consists in the securing of a cash payment by the car buyer of a certain prescribed amount as given in the accompanying table, and the balance in eight monthly installments, for each installment a note being given. The notes secured by the dealer are then sent through the distributor to the Guaranty Securities Co., which discounts them, remitting all of the face value of the notes except an amount running from \$100 to \$200, depending upon the value of the car. For this amount the dealer receives a deferred certificate, and it is payable when and if the customer's notes are paid. But if a dealer does not want to wait for this portion of the profit, he can immediately cash the certificate at a discount of 5 per cent. This does not apply to deferred certificates on farmers' notes, which are not discountable.

Going into the details of the plan, the car buyer is required to pay a small amount in excess of the list price of the car, this being for insurance and interest on the unpaid balance. The insurance covers fire, theft and transportation loss and is written under a blanket policy in the Automobile Insurance Co., Hartford, Conn., which is affiliated with the Aetna Life Insurance Co. Any scheme of reports or checking in order to make sure that in-

MONTHLY INSTALLMENT SALES TABLE
GOVERNING PURCHASE OF OVERLAND AND WILLYS-KNIGHT CARS ON TIME

| | Model 83 | | Model 84 | | Model 86 |
|-----------------------------------|----------|----------|------------|------------|------------|
| | Touring | Roadster | Touring | Roadster | Touring |
| 1 List—f. o. b. Toledo..... | \$750.00 | \$725.00 | \$1,095.00 | \$1,060.00 | \$1,145.00 |
| 2 Interest and insurance charge.. | 25.00 | 25.00 | 35.00 | 35.00 | 35.00 |
| 3 Time price | 775.00 | 750.00 | 1,130.00 | 1,095.00 | 1,180.00 |
| 4 Cash down | 275.00 | 250.00 | 530.00 | 495.00 | 580.00 |
| 5 Note 1 month..... | 50.00 | 50.00 | 75.00 | 75.00 | 75.00 |
| 6 Note 2 months..... | 60.00 | 60.00 | 75.00 | 75.00 | 75.00 |
| 7 Note 3 months..... | 60.00 | 60.00 | 75.00 | 75.00 | 75.00 |
| 8 Note 4 months..... | 60.00 | 60.00 | 75.00 | 75.00 | 75.00 |
| 9 Note 5 months..... | 65.00 | 65.00 | 75.00 | 75.00 | 75.00 |
| 10 Note 6 months..... | 65.00 | 65.00 | 75.00 | 75.00 | 75.00 |
| 11 Note 7 months..... | 75.00 | 75.00 | 75.00 | 75.00 | 75.00 |
| 12 Note 8 months..... | 75.00 | 75.00 | 75.00 | 75.00 | 75.00 |
| 13 Total notes | 500.00 | 500.00 | 600.00 | 600.00 | 600.00 |
| 14 Deduct interest and insurance. | 25.00 | 25.00 | 35.00 | 35.00 | 35.00 |
| 15 Deduct discount | 7.50 | 7.50 | 9.00 | 9.00 | 9.00 |
| 16 Proceeds | 467.50 | 467.50 | 556.00 | 556.00 | 556.00 |
| 17 Cash | 367.50 | 367.50 | 406.00 | 406.00 | 406.00 |
| 18 Deferred certificate | 100.00 | 100.00 | 150.00 | 150.00 | 150.00 |
| 19 Cash from customer..... | 275.00 | 250.00 | 530.00 | 495.00 | 580.00 |
| 20 Cash from G. S. Co..... | 367.50 | 367.50 | 406.00 | 406.00 | 406.00 |
| 21 Total cash | 642.50 | 617.50 | 936.00 | 901.00 | 986.00 |
| 22 Car dealer's cost..... | 630.00 | 609.00 | 920.00 | 895.00 | 962.00 |

surance had been properly written on each car would be so cumbersome and costly as to be prohibitive. Therefore it was decided that the insurance should be covered by a blanket policy, and that the charge for this insurance should be made in a lump sum and treated as a part of the time price of the car.

Forms have been provided on which to make the sales of cars under the guaranty plan in each of the different states so as to conform to the various laws. These forms are furnished to the dealers at \$1 per book.

In making a sale under the plan, the first thing the dealer does is to make the necessary inquiries of the buyer so as to fill out the purchaser's statement intelligibly. This statement is one of the forms supplied. The mortgage and notes are then filled out, and the insurance requisition made. From the moment this insurance blank is filled out and mailed by the dealer, the car is covered against fire and theft. A certificate of participation, showing the interest of the purchaser in the insurance, is issued in duplicate when the papers reach Toledo, one copy going to the customer and one accompanying the notes as collateral.

How Transaction is Handled

Having made the deal, the dealer endorses the notes and signs the assignment on the back of the mortgage, sending the papers on to the distributor. The latter also endorses the notes, signs and dates the mortgage or assignment and sends all the papers on to the Guaranty Securities Co. The latter then sends the money and deferred certificate to the distributor, from whom the Guaranty company actually buys the notes, but if the distributor receives them from a dealer, he at once endorses both check and certificate and sends them on to the dealer.

The purpose of holding back the \$100,

\$150 or \$200 in the form of a deferred certificate is twofold: First, the dealer's interest must be tied to the transaction until all the notes are paid, as the Guaranty Securities Co. is not in, and cannot enter, the motor car business, and in the event of a repossession of one car out of a hundred, it is necessary that the dealer handle the repossession. Therefore, it is thought only fair that he should wait for a part of his profit until his customer has paid out.

Deferred Certificates

The second reason is that the deferred certificate is necessary to provide the required borrowing margin for the Guaranty Securities Co. to finance the proposed purchases of this paper, which are likely to run into several millions of dollars. This money must come from banking centers, and in order to borrow it at the proper rate and in such unlimited quantities as to comply with the Guaranty Securities Co., it is stated that a margin of 25 per cent in the notes is necessary, so that it may deposit \$1.25 worth of notes against every dollar borrowed. This margin is obtained by the deferred certificate. As already stated, these certificates are, however, cashable through the distributors at 5 per cent discount, and the distributors can in turn use them in lieu of cash in paying for cars or other merchandise bought of Overland, at a discount of 50 cents per month for the unexpired term of the customer's notes. If the certificates are for \$150, the charge is .75 cents per month; \$200, \$1.00 per month.

For farmers' accommodation, the plan is a little different. The farmer is accustomed to pay for his goods at harvest time, and in order to meet his requirements the Guaranty Securities Co. has modified its arrangement on installment paper so that a note or notes may be given for the deferred payment due at any time up to 8

months. Further, the farmers' notes will be purchased direct from dealers as well as distributors, and will not be handled through the latter at all. The deferred certificate issued on farmers' notes cannot be discounted, but must be held by the dealer making the sale until the notes are paid.

The procedure in making the sale to a farmer under this plan is substantially the same as in the deferred payment method except that the mortgage, contract of conditional sale, or lease will not be assigned to the distributor, but the bottom assignment printed on the back of the form, running directly to the Guaranty company, will be used by the dealer instead.

Due to the fact that dealers in very many cases are unable to borrow during the winter season suitable amounts with which to take their allotments in cars from the distributors, and because dealers often ask for assistance so that instead of having a large number of cars in warehouses and distributing points they would be more generally distributed through the country in the hands of dealers, where they can be seen by possible buyers, the third kind of discount facilities was fostered by the Guaranty company.

The plan is for the distributor to draw

his draft at 1 to 4 months sight on the dealer, with bill of lading attached. These drafts will bear interest from the date of their acceptance, and each draft will usually cover a carload of cars. Drafts may be paid in whole or in part at any time up to their maturity, and interest will cease on each car covered by the draft as paid for.

There is no cost to the distributor involved in this plan, as the Guaranty Securities Co. will buy the acceptances from the distributor for their face value less only the cost of accommodation. In other words, the distributor will get his full dealer's price for the cars out of the acceptance. The proceeds of the draft will be sent to the distributor in cash except that a deferred certificate for \$150 per car will be issued, payable when and if the acceptance is paid by the dealer.

STUDEBAKERS IN TEST RUN

Detroit, Mich., Nov. 8—Today 115 Studebaker cars started in different parts of the country on a 4-day reliability tour promoted by the Studebaker Corp., the contestants being principally dealers and distributors of Studebaker cars. The start was made as near as possible at 6 a. m., the day's run being over a course of about 250 miles. All cars used are either fours

or sixes, standard stock, with full touring equipment, and carrying the number of passengers for which the car is designed. An observer in every car will keep track of happenings on the road. A record of the gasoline and oil consumption will be kept. The total distance of 1,000 miles to be run in the 4 days is to be covered as near as possible in 48 hours of actual running time. The tour has been arranged to get a gasoline and oil consumption record under ordinary touring conditions throughout the country.

VESUVIUS PLUG PRICES REDUCED

New York, Nov. 8—A marked price reduction for Vesuvius spark plugs is announced by the A. R. Mosler & Co., increased production more than offsetting the rising market on raw materials. The Vesuvius is standard equipment on the Pierce-Arrow, Simplex, Locomobile, Jeffrey and Case.

TO HANDLE HALLADAY SALES

Streator, Ill., Nov. 9—P. J. Eubanks has been placed in charge of the sales department of the Halladay line and hereafter will have supervision over all matters pertaining to advertising and distribution of this make of car.



MOTOR CARS IN WET PARADE

Three views of Sunday's Personal Liberty demonstration in Chicago—a protest against Sunday closing of saloons. There were 1,768 cars in the line

Los Angeles Show Creates a Sensation Among Motor Enthusiasts

Plan to Put the Angel City in Big Circuit Next Year—Moviedom
Furnishes Queens for Each Exhibit

LOS ANGELES, Cal., Nov. 6—Breaking all records for attendance, business and general interest, the Broadway Automobile and Flower Show, the official Los Angeles show promoted and managed by the Motor Car Dealers' Association, is declared to be the greatest motor salon ever held west of Chicago. The main feature of the show was its location. Instead of going outside the business district to the Shrine Auditorium, where private shows have been held for 2 years, the members of the committee in charge of the Broadway show secured one of the largest store buildings in the city.

There are four floors in the building on Broadway recently vacated by one of the largest stores in the city. The building is directly across the street from the city hall and in the very center of the business district.

Handsome Floral Decorations

The floral feature added greatly to the attractiveness of the show. On the third floor there was a floral display which is said to eclipse that at the Panama-Pacific exposition. The accessory exhibits were confined to the fourth floor, where there is ample room for displays with wide aisles for the visitors. Free dancing on the fourth floor at the rear of the accessories was a great attraction and the only objection to the show voiced by the dealers is that the crowds were so great that they could not get a chance to converse with their prospects.

At no show ever held in southern California have the dealers made so many sales. In one day, nineteen sales were closed on the show floors between 10 a.

m. and 6 p. m. In the past, the Los Angeles shows have been for the motorist only. The Broadway show attracted the dealers and agents from the territory which always have attended the eastern shows in the past, neglecting the local salons.

Never before have factory men attended the Los Angeles shows, but some of the biggest men in the industry were in Los Angeles especially for the show.

The magnitude of the show has aroused such enthusiasm among the eastern factory officials and representatives that a strenuous effort is to be made to put Los Angeles on the national show circuit for next year. Five factory representatives have promised that their factories will exhibit in Los Angeles next year. Some of the large dealers here claim that it makes no difference what the factories do, they will have large exhibits of their own next year, but they expect their factories to be in on the show which they claim will be on the circuit.

There were 7,800 paid admissions the first day of the show from 2 o'clock in the afternoon up to the time the show closed at 10:30. There were more than 6,000 paid admissions on Sunday. There were 10,000 present on Monday and Tuesday, while 12,000 paid admissions packed the place on Wednesday night until the doors were closed and hundreds were turned away. Wednesday night was given over to the motion picture people of southern California. Each exhibit had a queen and some of the most prominent stars of the screen were present to grace their favorite cars.

Motion picture night was a distinct novelty and with the film stars of this section owning motor cars to the amount of \$2,000,000, it is little wonder that they were well represented on their own night. From one company alone, 500 motion picture people attended the show on movie night.

MOTOR CAR INCREASES BATHING

Louisville, Ky., Nov. 6—That motor cars have greatly increased bathing is the opinion of the assistant plumbing inspector, Martin Palmer.

He says people want to die clean. When they step into a car they are not certain whether they are going to return home or wind up in a hospital or the morgue. Because they are doubtful of their ultimate destination, they want to be prepared for anything that may happen.

Mr. Palmer declares he reached his conclusion, on the relation of cars to the increase in baths, by questioning motorists when inspecting new bathtub installations.

COSTS \$10 TO HOLD ROAD

Iowa City, Ia., Nov. 8—N. W. Ingraham, of West Liberty, was fined \$10 and costs in Justice Ewing's court recently for violation of the statute regulating the giving of one-half of the public highway to a passing vehicle. The information was given by R. N. Carson. Carson and local officers were driving along the highway when they caught up with the car driven by Ingraham. Carson gave the required warning with his horn, but the car ahead failed to turn out and neither did it increase in speed, it is alleged.



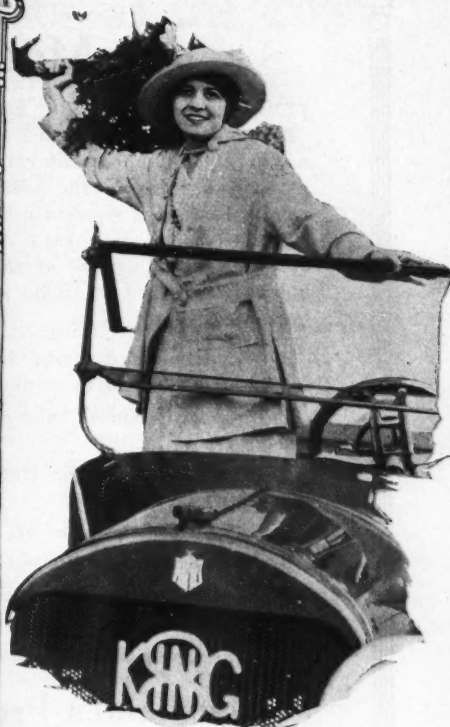
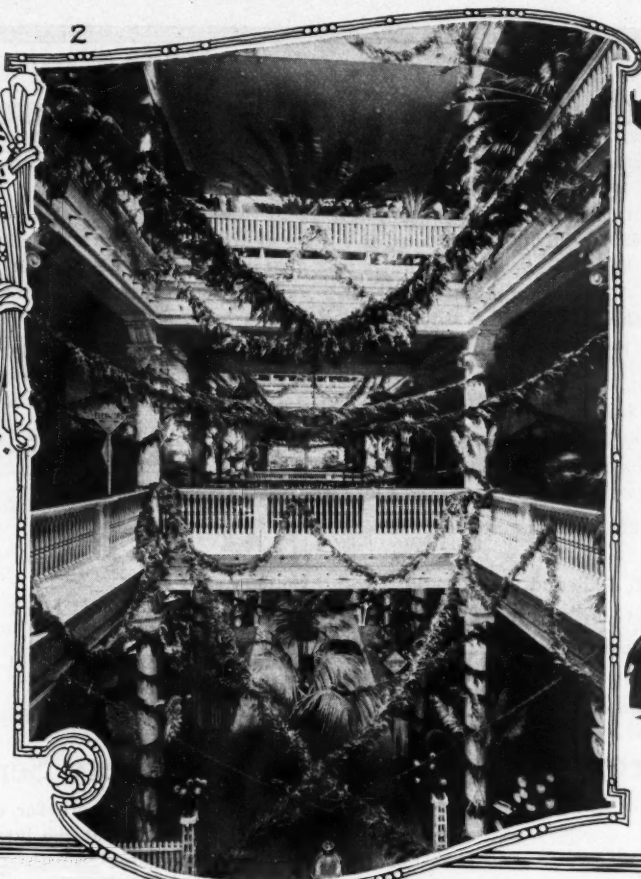
Edythe Sterling of 101 Bison Film Co. creates sensation by appearing as cow girl at Los Angeles show, while Myrtle Gonzales of Universal fame acts as queen of the White exhibit



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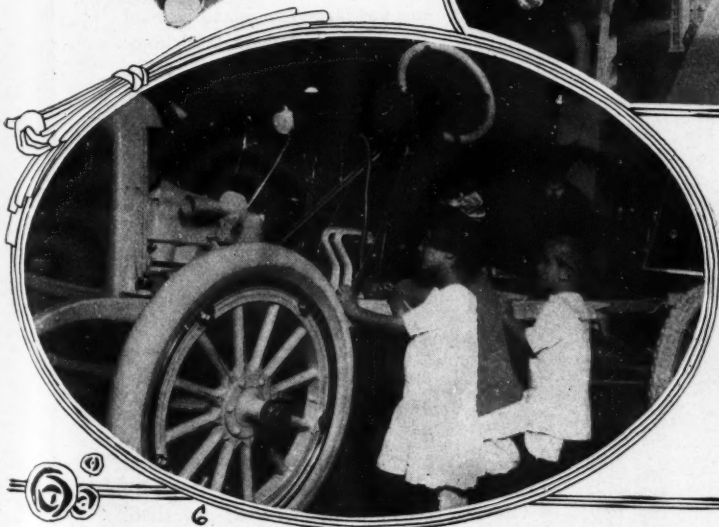
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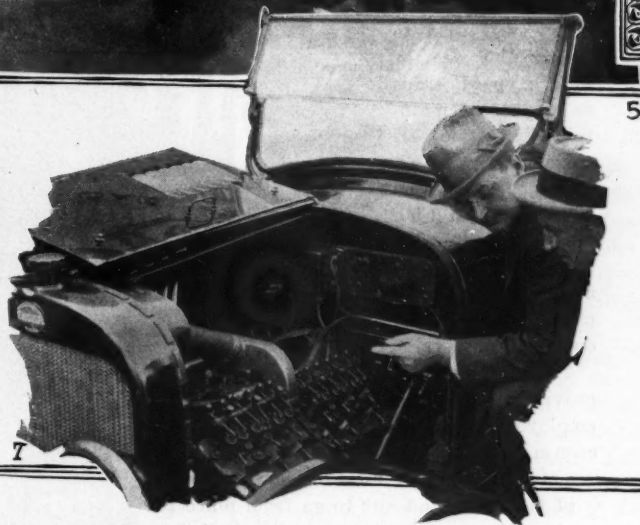
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VIEWS TAKEN AT THE MOST SUCCESSFUL MOTOR SHOW EVER HELD IN LOS ANGELES

1—Jackie Saunders, star of the Balboa Feature Film Co., who reigned as queen of the Reo exhibit. 2—How the Los Angeles motor show building was decorated. 3—Anna Little, of the American Film Co., was crowned queen of the Paige display. 4—Marguerite Snow, a film queen, who used a King eight for her throne. 5—Chalmers and Dodge booths at the Los Angeles show. 6—A Maxwell outout chassis attracted the kiddies. 7—Motor connoisseurs inspect the Enger twelve for the first time on the Pacific coast.

Model Street Traffic Ordinance

TO reduce accidents, the Safety First Federation in its annual session drafted a model street traffic ordinance, an ordinance that can be enforced in every city of 5,000 or over in the country. This is commendable work. It is what we should have had years ago and it is sincerely hoped that such a model ordinance will be quickly taken up in all of the cities. This ordinance is not the last word in traffic perfection, but it is a good beginning. Here it is:

- 1—Education and special instruction of policemen before assigning them to traffic duty.
- 2—Standard code of hand signals to be used by traffic officers.
- 3—Fixed locations for traffic officers at intersections to be distinctly marked.
- 4—Elimination of glare of head and side lights.
- 5—Use of muffler cut-outs to be prohibited.
- 6—Standardization of left-hand turns at intersections.
- 7—Near side stops for street cars.
- 8—Rear lights on all horse-drawn vehicles.

Maryland's Proposed Laws

PLANS for legislation to be submitted to the Maryland general assembly in January are being made by the Automobile Club of Maryland. Among the legislation the club desires is the following:

- 1—An act requiring all vehicles to carry lights at night.
- 2—An act providing for reciprocal relations between Maryland and the District of Columbia under which motorists of Maryland can go into the District without further registration, and the motorists of the District to come into Maryland without further registration.
- 3—An act prescribing present speed limits of 12 miles an hour in the thickly settled or built-up portions of cities, towns and villages and prohibiting any city, town or village from establishing any different limits or restrictions. The fines in all cases to go into the state road fund for the maintenance of our state roads.
- 4—An act or acts which will tend to check the use of unfair speed traps as at present maintained in some sections, but which will at the same time furnish the public protection against the reckless and unreasonable use of motor cars on our highways.
- 5—An act for providing for the employment by the commissioner of motor vehicles of an additional number of motorcycle officers to go from place to place in the state and assist in the intelligent enforcement of the speed law.

9—Elimination of steps on all horse-drawn and motor trucks.

10—Standard color, size, design and means of attachment for all street traffic signs, including school, hospital, church, safety zones, fire hydrants, railroad and street railway crossings, alley, mail box, playground, cross-walks, parking, etc.

11—Designation of safety zones and cross-walks as embodied in the Detroit plan of painting.

12—Education of the public to use cross-walks at intersections and authorizing police departments to control pedestrian travel as provided in section 2 of the Detroit traffic ordinance.

13—Standard traffic ordinance and code of regulations for adoption by all cities.

14—Licensing of drivers or operators of all motor vehicles.

15—Exclusive use of siren whistles on police and fire vehicles.

16—Standardization of accident reports by municipalities.

17—Chain guards on vehicles driven by the side chains.

Safety Semaphore

A STREET semaphore for controlling Chicago traffic is being tried out at the intersection of two of the busiest thoroughfares of the city. This is of the conventional "Stop" and "Go" type, and on the top is a combination red and green light similar to the type used for railroad switch signals. The red shows, for instance, north and south, while the green shows east and west.

Whether or not the semaphore will be definitely adopted on Chicago boulevards has not been determined as yet, but the trial is proving that this particular instrument under-

going test does not place the signal sufficiently high. It is only 8 feet above the street and high limousines and cars with tops up obstruct the view of the signal from those in following cars.

It also is thought the letters are not large enough to be readily seen at sufficient distance. Another and temporary objection to the semaphore is the fact that Chicago motorists have become educated to listening to the whistle rather than looking for a visible signal and some of them the first day or two have failed to observe the signal at all.

It is to be expected that Chicago shortly will follow the lead of her smaller but progressive sister cities in the definite adoption of some type of mechanical signal for traffic regulation.

So far as can be determined at present the semaphore seems to be the most practical. Detroit, Indianapolis, St. Louis and other cities have adopted this type after test.



Ferro Is Making a Twelve Along Same Lines as the Eight

V-Type with Overhead Valves—Has a Bore of 2 7-8 Inches and a Stroke of 4½ Inches—N. A. C. C. Rating, 39.7 Horsepower

FOLLOWING closely along the lines of the eight-cylinder, V-type motor it has brought out in the past, the Ferro Machine & Foundry Co., Cleveland, O., is producing a twelve that will employ the overhead plan. The Ferro believes this type of construction is superior in the production of power, as it does away with the valve cages and admits of using detachable heads, besides having other advantages.

The design permits unusual accessibility of parts, exceptional rigidity, reduction of carbon deposits and the use of any desired firing order and unusually low weight. The valve tappet adjustment is in the top of the cylinder head, enabling the car owner to take up valve clearance himself in a few minutes. The exhaust manifolds are on the outside of the motor, thus being out of the way.

Like the eight, the Ferro twelve has the cylinders and the upper half of the crankcase cast integral, which largely accounts for rigidity, lessening of vibration, etc. All coring for valves, passages and seats are cast in the head, which eliminates one of the difficulties of casting and greatly simplifies the cylinder. The cam arrangement permits the use of any desired firing order. Each cam operates its own valve and there are no rocker arms between the cam and the roller valve lifter.

While the new twelve is practically the same in every feature as the eight, it will not be put on the market until it has gone through road and factory tests like those given its smaller prototype. The new twelve weighs 730 pounds, without starter or generator, has a piston displacement of 350.5 cubic inches, and the valves

are 1¼ inches in diameter and have a .253-inch lift.

The front crankshaft bearing is 1½ by 3½; center, 2 by 2¼, and rear, 2½ by 2½.

Timing gears are driven by a Morse silent chain, the lubrication is force feed and cooling by pump.

STANDARDIZING ROAD SIGNS

Columbus, O., Nov. 10—Uniform sign posts for all Ohio roads is the aim toward which the state highway department is working. Since the motor car has come into general use, the need of sign posts, which once were more common than they are today, has been felt by travelers. Highway Commissioner Clinton Cowen has issued a set of standard specifications which local authorities are requested to follow. The letters on the signs are to be 2½ inches high. The letters are to be white and the background black, or vice versa.

ENGINEERS DISCUSS CYLINDERS

Buffalo, N. Y., Nov. 5—At a meeting of the Engineering Society of Buffalo held at the Statler hotel, the subject of multi-cylinder gasoline engines was discussed. There were 350 members of the society in attendance, many of whom are prominent in the motor industry.

The subject was presented by O. E. Hunt, of Detroit, engineer of the Packard Motor Car Co., and the discussion was carried on by David Fergusson, engineer of the passenger car department of the Pierce Arrow Co.; O. E. Spillman, of the Herschell-Spillman Co., of Tonawanda; Ernest Harris, assistant to Mr. Fergusson and Otto

Burkhardt, also from the Pierce factory.

Mr. Hunt's presentation included the letter which J. G. Vincent wrote the Packard company urging the concern of which he is vice-president, to build a twin-six motor. Mr. Hunt dwelt on the engineering considerations in designing a twelve-cylinder car in particular and a multi-cylinder types in general. Mr. Fergusson defended the six and sought to prove by scientifically worked-out diagrams that the characteristics of the six-cylinder motor with the cylinders arranged in a single row are as good as those of the twelve or twin-

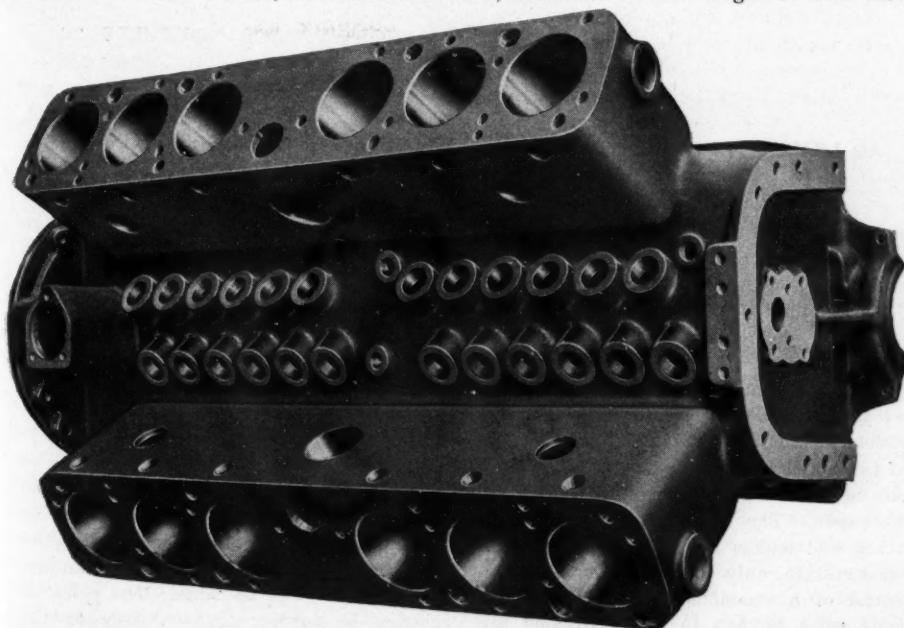
START FOREIGN TRADE INQUIRY

Washington, D. C., Nov. 6—Motor car and accessory manufacturers will be among those who will shortly receive from the federal trade commission a letter of inquiry, followed up by a brief schedule, as a part of the investigation of conditions that affect American foreign trade.

The war in Europe has so affected the trade of the world that American enterprise has a peculiar opportunity to supply the wants of foreign markets and to secure a greatly enlarged share of their trade. The commission, therefore, deems it to be its duty to complete, with all possible dispatch, an investigation which may assist congress in determining what action may be required in the public interest for the promotion of American foreign trade.

FORM COMPANY TO MAKE CHASSIS

Detroit, Mich., Nov. 2—The Detroit Chassis Co., temporarily capitalized at \$10,000, has been organized and has leased the plant formerly occupied by the Vitralite Co., West Grand boulevard and Hubbard avenue, where manufacturing of a standard chassis has been started. It is the object of the new company to cater especially to carriage and buggy makers and offer them a chassis at a price which, when the car is completely equipped, will enable them to compete successfully with the motor car manufacturer. Instead of putting out a chassis with a specified line of parts or components, such as carbureter, ignition system, starting and lighting system, this part of the equipment will be entirely optional with the party, plant or concern placing an order, and the price naturally will be made according to the equipment required. The chassis itself will be only made in one size, 110-inch wheelbase, and standard tread. The motor will be a four-cylinder block, 3¼ by 5. The wheels will be of the artillery type, with 32 by 3½ tires. The weight of the chassis will be about 1,100 pounds. six arrangement.



Cylinder casting of new Ferro twelve-cylinder engine. All the cylinders and the upper half of the crankcase are a single block

Speedway for Canada

Syndicate Formed to Construct Track 5 Miles from Montreal

Promoters Favor Building Course on Plans of Fred Wellman

MONTREAL, Can., Nov. 9—Indianapolis, Chicago, New York and the other centers of speedway racing in the United States are to have a rival next year across the Canadian boundary line, as a syndicate of Montreal sportsmen are planning to construct a course here and have it ready for the first meet early in June.

A site already has been selected by the promoters. It consists of 320 acres of ground and is located 5 miles from the center of the city in a territory served by the Grand Trunk railroad and the Montreal and Southern Counties street cars. T. C. Kirby, head of the Montreal Automobile Trade Association, is taking an active part in the promotion of the project and has been made general manager of the Canadian Speedway Co., Ltd., with offices in the King's Hall building.

The local promoters favor building a speedway according to the plans of Fred Wellman, assistant business manager of the Indianapolis speedway, which were fully described in the October 28 issue of Motor Age. The Wellman track is a combination of a road race course and speedway, making possible all the thrills attendant upon the former class of contests and the high speed of the latter, it is claimed.

SECURE LAND FOR SPEEDWAY

St. Joseph, Mo., Nov. 8—Preliminary plans for the construction of a 2-mile concrete speedway here have met with success and the land at Lake Contrary, south of the city, on which the stands and track will be built, has been turned over to the promoters, who claim that construction work will be started very soon in order that the plant will be completed for the inaugural meet early in the spring.

MARMON FIRST AT TUCSON

Tucson, Ariz., Nov. 6—C. A. Bennett, driving a Marmon, won the 103.15-mile race that was held here today over the 4.29-mile dirt track. His time for the distance was 1 hour, 53 minutes, 24 seconds. Travis Bailey, in a Velie, and Tom Brewer, at the wheel of a Pope, took second and third money. The purse was \$1,000. The course was muddy and slippery from recent rains and fast time was impossible. Bob Clark, driving a Fiat, made the fast lap, 3 minutes, 52 seconds.

FILES LIEN ON TWIN CITY TRACK

Minneapolis, Minn., Nov. 6—T. J. Fredrick and M. W. Bardard, of St. Paul, contractors, have filed a lien here on the Twin City Motor Speedway Co. to cover a claim

of \$18,513. The lien applies also to J. F. Sperry and the Sperry Realty Co., which had charge of the construction of the 2-mile concrete track, which was dedicated with a 500-mile race September 4. The original debt was \$50,657.

EQUIPMENT ON RESTA'S PEUGEOT

New York, Nov. 9—The equipment on Resta's Peugeot, which won the 100-mile invitation race for the Harkness gold cup last week, included Bosch magneto, Zenith carbureter, Boyce motometer, Hartford shock absorbers, K. L. G. spark plugs, and Silvertown cord tires. Resta used Oilzurn as a motor lubricant.

E. V. A. BATTERY STANDARDIZATION

Chicago, Nov. 9—Standardization of batteries, especially as to method of assembly in trays, number of cells per tray and the sizes of rubber jars, was the subject taken up at the meeting of the Chicago section of the E. V. A. at the Hotel Metropole today. W. F. Bauer, of the Edison Storage Battery Co., and chairman of the standardization committee of the Chicago section, told of the work of his committee since it began last March, of the recommendations made and the reasons therefor. The recommendations of this committee is in harmony with those of the similar committee of the parent body.

STUDEBAKER HEADS TIRE CONCERN

South Bend, Ind., Nov. 5—Peter E. Studebaker, son of the late Henry Studebaker, one of the founders of the Studebaker Corp., has accepted the presidency of the International Indian Rubber Tire Co., a \$1,000,000 corporation recently organized in South Bend. The concern will make motor car tires and sell direct to the dealers.

The officers of the company are: E. H. Schwab, Bethlehem, Pa., vice-president; G. W. Odell, Findlay, Ohio, secretary; J. R. Nobile, treasurer. These men, with William S. Moore, city engineer of Grand Rapids, Mich., form the board of directors.

AD LEADS TO POLICE STATION

Pittsburgh, Pa., Nov. 10—The police are seeking an industrious agent of a gasoline concern who has devised an advertisement in exact reproduction of the tag which is handed to the motor car driver or owner who has violated the traffic rules of the city. The police say the agent of the gasoline concern has been very active and already has caused great annoyance to motorists as well as the police. The agent approaches the motorist and hands him a red tag which has the appearance of having been separated in the regular way from its coupon. The driver stuffs it into his pocket and makes his way to the central police station, only to find on examination instead of a summons for a violation of traffic rules he has in his possession an advertisement for gasoline.

Racing in Florida

Speed Trials May Be Held at Daytona Coming Winter

Aitkens' Peugeot to Give Exhibition Dashes at Miami

JACKSONVILLE, Fla., Nov. 9—After a thrill-less hiatus of 4 years, Florida may again be the scene of motor car racing this winter when a series of speed trials probably will be held at Daytona and Miami.

The sportsmen of Daytona now are planning to invite Ralph de Palma, Dario Resta, Bob Burman and several of the other stars of the gasoline circuit to participate in a series of time trials on the famous Daytona-Ormond beach course where Barney Oldfield and Wild Bob Burman hung up new world's records in 1910 and 1911.

Carl G. Fisher, president of the Indianapolis motor speedway, who makes his winter residence at Miami, also announced recently that he would ship one of his Peugeots to Miami and with Johnny Aitken at the wheel, hold daily exhibitions on the beach in order to show the residents how a racing car looks when it is traveling at a speed of 120 miles an hour or more.

Florida beach courses are now credited with all the American straightaway records, regardless of class, from 1 kilometer up to 300 miles, all the marks having been established at Daytona and Jacksonville. The Daytona course probably is the most famous as it was there that Burman and the Blitzen Benz covered 1 kilometer in 2 miles in 51.28 seconds. It was here Burman set a record that was bettered only by Duray.

PHOENIX RACE NOVEMBER 20

Phoenix, Ariz., Nov. 10—With the annual Los Angeles-Phoenix road race and the Corona classic abandoned for 1915, interest of the speed fans of the Pacific coast now is centered on the 150-mile event that will be held on the 1-mile dirt track here a week from Saturday, November 20, for prize money totaling \$5,000. The race will be run as an attraction of the Arizona state fair and the entries already received assure a large field of starters when the starting bomb is fired a week from Saturday.

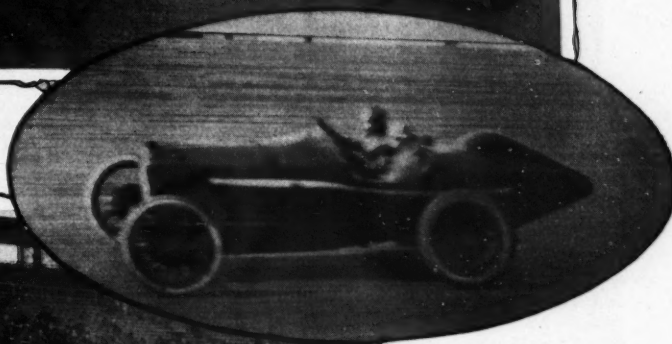
GASOLINE RAISE GENERAL

New York, Nov. 6—Another advance of 1 cent occurred last week in the gasoline field. Garages in this city are charging owners 22 cents a gallon for gasoline, an advance of 1 cent. During the summer, the low price was 16 cents. The price of gasoline in northern New Jersey to the owner has been increased by 1 cent to

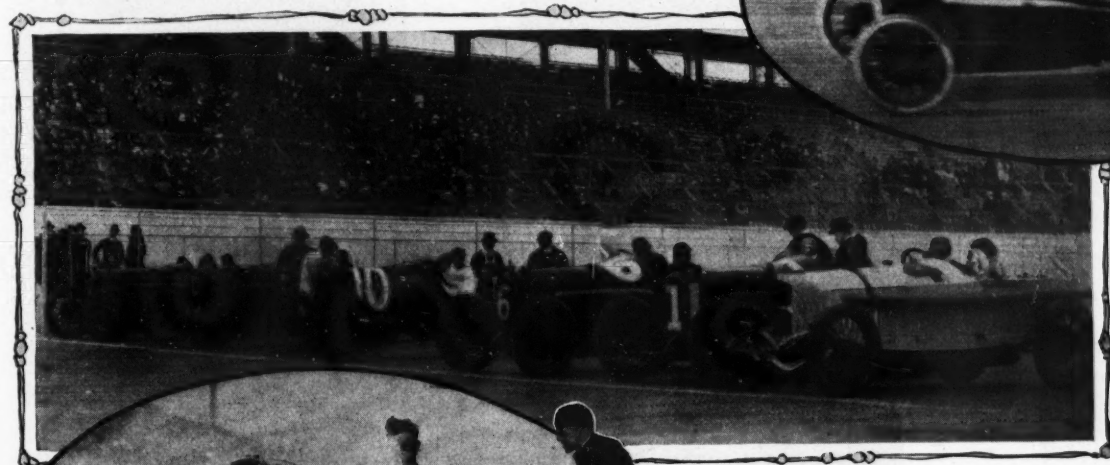
Incidents in Final Speedway Race of the Season, Held at Sheepshead Bay Track, November 2



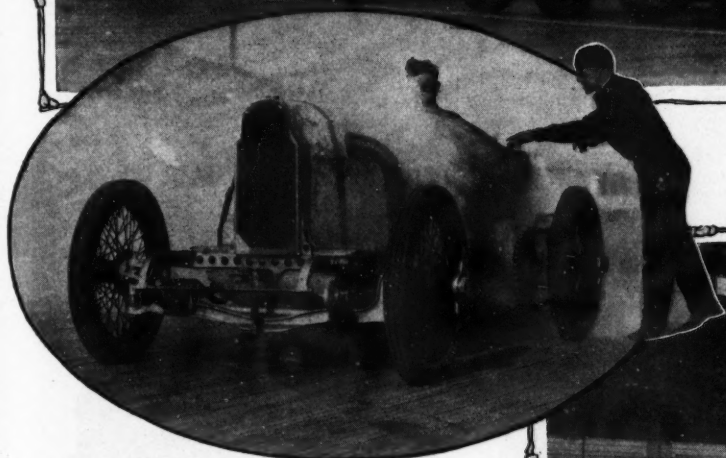
Resta, de Palma and Burman taking one of the turns in the 100-mile Election Day race at the Sheepshead Bay speedway



Ralph Mulford, burning some of the splinters off the track in his Peugeot



Lineup of the six contenders in the final speedway race of the season



Bob Burman about to warm up the Blitz Benz for match race with de Palma



Start of the match race between de Palma's Sunbeam and Burman's Blitz Bens

19 cents by the gasoline delivery wagons.

Philadelphia gasoline has been advanced 1 cent to 15 cents a gallon. Boston gasoline also received a 1-cent advance and is now quoting at 19 cents on the tank wagon basis. Standard Oil in that city has advanced the price 1 cent to 19 cents, tank wagon basis, meeting the earlier advance of the independents.

The Standard Oil Co. of Nebraska has advanced the price of gasoline on tank wagon basis to 13 cents a gallon and has made corresponding advances throughout its entire territory. In Omaha, the price has been advanced $\frac{1}{2}$ cent to 13 cents, tank wagon basis. The last 30 days has

seen a rise from 10 cents, the low price this summer, and in fact the low price since March.

The Standard Oil of Kentucky has advanced gasoline prices 1 cent to $14\frac{1}{2}$ cents, tank wagons and garage basis.

At Nashville, Standard Oil now quotes at 16 cents a gallon to garages and in lots of less than 100 gallons. The Gulf Refining quotes the straight price of 17

cents. The price last March was 10 cents a gallon. The independents have advanced their price 1 cent to 11.8 cents a gallon, tank wagon basis. This meets the price of the Standard Oil, which has not been changed since the last previous advance.

The Atlantic Refining Co., in Pittsburgh, has advanced gasoline 1 cent a gallon to owners.

Comfort and Style for the Woman Motorist Who Braves



Velvet motor cap, which can be had in the following combinations: Black and green, black and purple, and black and gray. Price \$3. Also a pongee driving mask which sells for \$3.50.



Motor coat of Scotch tweed with raccoon collar. Price \$65. The hat is made of velour with angora edging and trimmed with a wood crochet flower. This hat may be had in the following colors: Rose, taupe, brown, green and blue. Price \$15. Shown by Abercrombie & Fitch, New York.



Leather shirt for wear under motor coat, featured by knit collars and cuffs. Price \$10. The hat is Austrian velour and comes in brown, black and green. Price \$15. Shown by Abercrombie & Fitch, New York.



Washable and dust-proof motor veil in several colors. Price \$5.00. Shown by Saks & Co., New York, N. Y.



Feather cushion with red leather cover to be used as support for back. Price \$16.50. Shown by Saks & Co., New York, N. Y.

the Chilling Blasts of Late Autumn in Her Car



White angora wool muffler. This comes with borders of brown, blue, green, purple, maroon and gray. Price \$3.00. Shown by the Auto Supply Co., New York.



Zibiline motor coat of black and white mixture, featured by extremely full back, large patch pockets and squirrel collar. Price \$40. Shown by Saks & Co., New York. The hat is a large rolling sailor model of velvet with silk stitched brim and finished with a silk band and bow. It comes in blue and black. Price \$5.



Silk raincoat which comes in black, brown, green and tan. Price \$17.50. Shown by the Auto Supply Co., New York.



Rainproof motor coat made of a heavy English brown mixture and featured by an otter collar. Its extreme fullness insures warmth to the wearer. Price \$65. The hat is a toque with a green satin crown and velvet brim, trimmed with a velvet rosette and satin stick-up.



Mohair sweater and scarf, which come in blue, tan, green, violet, gray and white. The price of the sweater is \$10 and that of the scarf, \$3. Shown by Abercrombie & Fitch, New York, N. Y. A cap can be had to match in all colors. Price \$2.

Piston Displacements of Fours, Sixes, Eights and Twelves

ON this and the three following pages are given tables showing the piston displacement in cubic inches of motors having the bores and strokes in ordinary use for four cylinders, six cylinders, eight cylinders and twelve cylinders.

By the term "piston displacement of a motor" is meant the volume of gas in the cylinders displaced by the pistons in their movement from the upper to the lower point of their stroke. The piston displacement of any one cylinder is equal to the volume of a cylinder whose diameter is the bore and whose height is the length of the stroke. The piston displacement in cubic inches of a motor is found by multiplying the cylinder bore in inches by itself and then by .7854 and then by the stroke in inches. This gives the piston displacement of each cylinder. If the product thus found be multiplied by the number of cylinders of the motor, we will have the piston displacement of the motor. The standard formula for piston displacement is $\text{Dia.}^2 \times \text{stroke} \times \text{number of cylinders}$.

Condensed formulas for motors with a definite number of cylinders can be obtained from the standard formula by combining the factors .7854 and the number of cylinders. Thus, the piston displacement of four-cylinder motors equals $\text{Dia.}^2 \times \text{stroke} \times 4 \times .7854$; combining the last two factors by multiplying them together, we have, $\text{P. D.} = 3.141 \times \text{D}^2 \times \text{S}$, for four-cylinder motors. In the same way, $\text{P. D.} = 4.712 \times \text{D}^2 \times \text{S}$ for six-cylinder motors. For eight-cylinder motors, the for-

mula would become $6.283 \times \text{D}^2 \times \text{S}$ and for twelve-cylinder motors it would become $9.425 \times \text{D}^2 \times \text{S}$.

In using the tables, to find the displacement, it is necessary only to follow the line of figures corresponding to the bore of the engine to the vertical column headed by the stroke of the engine. For instance, assume that it is desired to find the displacement of a four-cylinder motor of 4-inch bore and 5½-inch stroke. In the left-hand column of the table below we find 4 inches under "Bore," then follow across the horizontal line to the column headed 5½ under "Stroke." The figure given is 276.5, which is the displacement of a four-cylinder motor of those dimensions.

A comparison of the limits of the tables for engines of four, six, eight and twelve cylinders makes an interesting study in cylinder sizes. The four-cylinder displacement table gives cylinder volumes for motors having a bore between 3 inches and 6½ inches in diameter and strokes between 3 and 6¾ inches in length. In the six-cylinder displacement table motors having a bore as small as 2½ inches are considered while the upper limit has dropped to 5½ inches. Strokes are longer and are listed between 4 and 7½ inches. In the eight-cylinder table it will be seen that the limits of the stroke have dropped very much, that is between 2½ and 6½ inches. The bores given for the eights are between 2½ and 5; the twelves, between 2¼ and 3½ bore and between 2¼ and 6-inch stroke.

Piston Displacement in Cubic Inches of Four-Cylinder Motors

| STROKE IN INCHES | | | | | | | | | | | | | | | | | LIMIT OF ERROR 0.04 CUBIC INCHES | | | | | | | | | | | | | | | | |
|------------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|
| BORE Inches | STROKE IN INCHES | | | | | | | | | | | | | | | | LIMIT OF ERROR 0.04 CUBIC INCHES | | | | | | | | | | | | | | | | |
| | 3 | 3½ | 3¾ | 4 | 4½ | 4¾ | 5 | 5½ | 5¾ | 6 | 6½ | 6¾ | 7 | 7½ | 7¾ | 8 | 6 | 6½ | 6¾ | 7 | 7½ | 7¾ | 8 | 8½ | 8¾ | 9 | 9½ | 9¾ | | | | | |
| 3 | 84.8 | 88.4 | 91.9 | 95.4 | 99.0 | 102.5 | 106.0 | 109.5 | 113.0 | 116.5 | 120.0 | 123.5 | 127.0 | 130.5 | 134.0 | 137.5 | 141.0 | 144.5 | 148.0 | 151.5 | 155.0 | 158.5 | 162.0 | 165.5 | 169.0 | 172.5 | 176.0 | 179.5 | | | | | |
| 3½ | 88.4 | 92.0 | 95.7 | 99.4 | 103.1 | 106.8 | 110.5 | 114.2 | 117.9 | 121.6 | 125.3 | 129.0 | 132.7 | 136.4 | 140.1 | 143.8 | 147.5 | 151.2 | 154.9 | 158.6 | 162.3 | 166.0 | 169.7 | 173.4 | 177.1 | 180.8 | 184.5 | 188.2 | | | | | |
| 3¾ | 91.9 | 95.7 | 99.7 | 103.7 | 107.7 | 111.7 | 115.7 | 119.7 | 123.7 | 127.7 | 131.7 | 135.7 | 139.7 | 143.7 | 147.7 | 151.7 | 155.7 | 159.7 | 163.7 | 167.7 | 171.7 | 175.7 | 179.7 | 183.7 | 187.7 | 191.7 | 195.7 | 199.7 | | | | | |
| 4 | 95.4 | 99.7 | 103.7 | 107.7 | 111.7 | 115.7 | 119.7 | 123.7 | 127.7 | 131.7 | 135.7 | 139.7 | 143.7 | 147.7 | 151.7 | 155.7 | 159.7 | 163.7 | 167.7 | 171.7 | 175.7 | 179.7 | 183.7 | 187.7 | 191.7 | 195.7 | 199.7 | 203.7 | | | | | |
| 4½ | 99.0 | 103.1 | 107.1 | 111.1 | 115.1 | 119.1 | 123.1 | 127.1 | 131.1 | 135.1 | 139.1 | 143.1 | 147.1 | 151.1 | 155.1 | 159.1 | 163.1 | 167.1 | 171.1 | 175.1 | 179.1 | 183.1 | 187.1 | 191.1 | 195.1 | 199.1 | 203.1 | 207.1 | | | | | |
| 4¾ | 102.5 | 106.8 | 110.8 | 114.8 | 118.8 | 122.8 | 126.8 | 130.8 | 134.8 | 138.8 | 142.8 | 146.8 | 150.8 | 154.8 | 158.8 | 162.8 | 166.8 | 170.8 | 174.8 | 178.8 | 182.8 | 186.8 | 190.8 | 194.8 | 198.8 | 202.8 | 206.8 | 210.8 | | | | | |
| 5 | 106.0 | 110.5 | 114.5 | 118.5 | 122.5 | 126.5 | 130.5 | 134.5 | 138.5 | 142.5 | 146.5 | 150.5 | 154.5 | 158.5 | 162.5 | 166.5 | 170.5 | 174.5 | 178.5 | 182.5 | 186.5 | 190.5 | 194.5 | 198.5 | 202.5 | 206.5 | 210.5 | 214.5 | | | | | |
| 5½ | 109.5 | 114.2 | 118.2 | 122.2 | 126.2 | 130.2 | 134.2 | 138.2 | 142.2 | 146.2 | 150.2 | 154.2 | 158.2 | 162.2 | 166.2 | 170.2 | 174.2 | 178.2 | 182.2 | 186.2 | 190.2 | 194.2 | 198.2 | 202.2 | 206.2 | 210.2 | 214.2 | 218.2 | | | | | |
| 5¾ | 113.0 | 117.9 | 121.9 | 125.9 | 129.9 | 133.9 | 137.9 | 141.9 | 145.9 | 149.9 | 153.9 | 157.9 | 161.9 | 165.9 | 169.9 | 173.9 | 177.9 | 181.9 | 185.9 | 189.9 | 193.9 | 197.9 | 201.9 | 205.9 | 209.9 | 213.9 | 217.9 | 221.9 | | | | | |
| 6 | 116.5 | 121.6 | 125.6 | 129.6 | 133.6 | 137.6 | 141.6 | 145.6 | 149.6 | 153.6 | 157.6 | 161.6 | 165.6 | 169.6 | 173.6 | 177.6 | 181.6 | 185.6 | 189.6 | 193.6 | 197.6 | 201.6 | 205.6 | 209.6 | 213.6 | 217.6 | 221.6 | 225.6 | | | | | |
| 6½ | 120.0 | 125.3 | 129.3 | 133.3 | 137.3 | 141.3 | 145.3 | 149.3 | 153.3 | 157.3 | 161.3 | 165.3 | 169.3 | 173.3 | 177.3 | 181.3 | 185.3 | 189.3 | 193.3 | 197.3 | 201.3 | 205.3 | 209.3 | 213.3 | 217.3 | 221.3 | 225.3 | 229.3 | | | | | |
| 6¾ | 123.5 | 128.8 | 132.8 | 136.8 | 140.8 | 144.8 | 148.8 | 152.8 | 156.8 | 160.8 | 164.8 | 168.8 | 172.8 | 176.8 | 180.8 | 184.8 | 188.8 | 192.8 | 196.8 | 200.8 | 204.8 | 208.8 | 212.8 | 216.8 | 220.8 | 224.8 | 228.8 | 232.8 | | | | | |
| 7 | 127.0 | 132.7 | 136.7 | 140.7 | 144.7 | 148.7 | 152.7 | 156.7 | 160.7 | 164.7 | 168.7 | 172.7 | 176.7 | 180.7 | 184.7 | 188.7 | 192.7 | 196.7 | 200.7 | 204.7 | 208.7 | 212.7 | 216.7 | 220.7 | 224.7 | 228.7 | 232.7 | 236.7 | | | | | |
| 7½ | 130.5 | 136.4 | 140.4 | 144.4 | 148.4 | 152.4 | 156.4 | 160.4 | 164.4 | 168.4 | 172.4 | 176.4 | 180.4 | 184.4 | 188.4 | 192.4 | 196.4 | 200.4 | 204.4 | 208.4 | 212.4 | 216.4 | 220.4 | 224.4 | 228.4 | 232.4 | 236.4 | 240.4 | | | | | |
| 7¾ | 134.0 | 140.1 | 144.1 | 148.1 | 152.1 | 156.1 | 160.1 | 164.1 | 168.1 | 172.1 | 176.1 | 180.1 | 184.1 | 188.1 | 192.1 | 196.1 | 200.1 | 204.1 | 208.1 | 212.1 | 216.1 | 220.1 | 224.1 | 228.1 | 232.1 | 236.1 | 240.1 | 244.1 | | | | | |
| 8 | 137.5 | 143.8 | 147.8 | 151.8 | 155.8 | 159.8 | 163.8 | 167.8 | 171.8 | 175.8 | 179.8 | 183.8 | 187.8 | 191.8 | 195.8 | 199.8 | 203.8 | 207.8 | 211.8 | 215.8 | 219.8 | 223.8 | 227.8 | 231.8 | 235.8 | 239.8 | 243.8 | 247.8 | | | | | |
| 8½ | 141.0 | 147.5 | 151.5 | 155.5 | 159.5 | 163.5 | 167.5 | 171.5 | 175.5 | 179.5 | 183.5 | 187.5 | 191.5 | 195.5 | 199.5 | 203.5 | 207.5 | 211.5 | 215.5 | 219.5 | 223.5 | 227.5 | 231.5 | 235.5 | 239.5 | 243.5 | 247.5 | 251.5 | | | | | |
| 8¾ | 144.5 | 151.2 | 155.2 | 159.2 | 163.2 | 167.2 | 171.2 | 175.2 | 179.2 | 183.2 | 187.2 | 191.2 | 195.2 | 199.2 | 203.2 | 207.2 | 211.2 | 215.2 | 219.2 | 223.2 | 227.2 | 231.2 | 235.2 | 239.2 | 243.2 | 247.2 | 251.2 | 255.2 | | | | | |
| 9 | 148.0 | 154.9 | 158.9 | 162.9 | 166.9 | 170.9 | 174.9 | 178.9 | 182.9 | 186.9 | 190.9 | 194.9 | 198.9 | 202.9 | 206.9 | 210.9 | 214.9 | 218.9 | 222.9 | 226.9 | 230.9 | 234.9 | 238.9 | 242.9 | 246.9 | 250.9 | 254.9 | 258.9 | | | | | |
| 9½ | 151.5 | 158.6 | 162.6 | 166.6 | 170.6 | 174.6 | 178.6 | 182.6 | 186.6 | 190.6 | 194.6 | 198.6 | 202.6 | 206.6 | 210.6 | 214.6 | 218.6 | 222.6 | 226.6 | 230.6 | 234.6 | 238.6 | 242.6 | 246.6 | 250.6 | 254.6 | 258.6 | 262.6 | | | | | |
| 9¾ | 155.0 | 162.3 | 166.3 | 170.3 | 174.3 | 178.3 | 182.3 | 186.3 | 190.3 | 194.3 | 198.3 | 202.3 | 206.3 | 210.3 | 214.3 | 218.3 | 222.3 | 226.3 | 230.3 | 234.3 | 238.3 | 242.3 | 246.3 | 250.3 | 254.3 | 258.3 | 262.3 | 266.3 | | | | | |
| 10 | 158.5 | 166.0 | 170.0 | 174.0 | 178.0 | 182.0 | 186.0 | 190.0 | 194.0 | 198.0 | 202.0 | 206.0 | 210.0 | 214.0 | 218.0 | 222.0 | 226.0 | 230.0 | 234.0 | 238.0 | 242.0 | 246.0 | 250.0 | 254.0 | 258.0 | 262.0 | 266.0 | 270.0 | | | | | |
| 10½ | 162.0 | 170.7 | 174.7 | 178.7 | 182.7 | 186.7 | 190.7 | 194.7 | 198.7 | 202.7 | 206.7 | 210.7 | 214.7 | 218.7 | 222.7 | 226.7 | 230.7 | 234.7 | 238.7 | 242.7 | 246.7 | 250.7 | 254.7 | 258.7 | 262.7 | 266.7 | 270.7 | 274.7 | | | | | |
| 10¾ | 165.5 | 174.4 | 178.4 | 182.4 | 186.4 | 190.4 | 194.4 | 198.4 | 202.4 | 206.4 | 210.4 | 214.4 | 218.4 | 222.4 | 226.4 | 230.4 | 234.4 | 238.4 | 242.4 | 246.4 | 250.4 | 254.4 | 258.4 | 262.4 | 266.4 | 270.4 | 274.4 | 278.4 | | | | | |
| 11 | 169.0 | 178.9 | 182.9 | 186.9 | 190.9 | 194.9 | 198.9 | 202.9 | 206.9 | 210.9 | 214.9 | 218.9 | 222.9 | 226.9 | 230.9 | 234.9 | 238.9 | 242.9 | 246.9 | 250.9 | 254.9 | 258.9 | 262.9 | 266.9 | 270.9 | 274.9 | 278.9 | 282.9 | | | | | |
| 11½ | 172.5 | 182.6 | 186.6 | 190.6 | 194.6 | 198.6 | 202.6 | 206.6 | 210.6 | 214.6 | 218.6 | 222.6 | 226.6 | 230.6 | 234.6 | 238.6 | 242.6 | 246.6 | 250.6 | 254.6 | 258.6 | 262.6 | 266.6 | 270.6 | 274.6 | 278.6 | 282.6 | 286.6 | | | | | |
| 11¾ | 176.0 | 186.3 | 190.3 | 194.3 | 198.3 | 202.3 | 206.3 | 210.3 | 214.3 | 218.3 | 222.3 | 226.3 | 230.3 | 234.3 | 238.3 | 242.3 | 246.3 | 250.3 | 254.3 | 258.3 | 262.3 | 266.3 | 270.3 | 274.3 | 278.3 | 282.3 | 286.3 | 290.3 | | | | | |
| 12 | 179.5 | 190.0 | 194.0 | 198.0 | 202.0 | 206.0 | 210.0 | 214.0 | 218.0 | 222.0 | 226.0 | 230.0 | 234.0 | 238.0 | 242.0 | 246.0 | 250.0 | 254.0 | 258.0 | 262.0 | 266.0 | 270.0 | 274.0 | 278.0 | 282.0 | 286.0 | 290.0 | 294.0 | | | | | |
| 12½ | 183.0 | 193.7 | 197.7 | 201.7 | 205.7 | 209.7 | 213.7 | 217.7 | 221.7 | 225.7 | 229.7 | 233.7 | 237.7 | 241.7 | 245.7 | 249.7 | 253.7 | 257.7 | 261.7 | 265.7 | 269.7 | 273.7 | 277.7 | 281.7 | 285.7 | 289.7 | 293.7 | 297.7 | | | | | |
| 12¾ | 186.5 | 197.4 | 201.4 | 205.4 | 209.4 | 213.4 | 217.4 | 221.4 | 225.4 | 229.4 | 233.4 | 237.4 | 241.4 | 245.4 | 249.4 | 253.4 | 257.4 | 261.4 | 265.4 | 269.4 | 273.4 | 277.4 | 281.4 | 285.4 | 289.4 | 293.4 | 297.4 | 301.4 | | | | | |
| 13 | 190.0 | 201.0 | 205.0 | 209.0 | 213.0 | 217.0 | 221.0 | 225.0 | 229.0 | 233.0 | 237.0 | 241.0 | 245.0 | 249.0 | 253.0 | 257.0 | 261.0 | 265.0 | 269.0 | 273.0 | 277.0 | 281.0 | 285.0 | 289.0 | 293.0 | 297.0 | 301.0 | 305.0 | | | | | |
| 13½ | 193.5 | 204.7 | 208.7 | 212.7 | 216.7 | 220.7 | 224.7 | 228.7 | 232.7 | 236.7 | 240.7 | 244.7 | 248.7 | 252.7 | 256.7 | 260.7 | 264.7 | 268.7 | 272.7 | 276.7 | 280.7 | 284.7 | 288.7 | 292.7 | 296.7 | 300.7 | 304.7 | 308.7 | | | | | |
| 13¾ | 197.0 | 208.4 | 212.4 | 216.4 | 220.4 | 224.4 | 228.4 | 232.4 | 236.4 | 240.4 | 244.4 | 248.4 | 252.4 | 256.4 | 260.4 | 264.4 | 268.4 | 272.4 | 276.4 | 280.4 | 284.4 | 288.4 | 292.4 | 296.4 | 300.4 | 304.4 | 308.4 | 312.4 | | | | | |
| 14 | 200.5 | 212.1 | 216.1 | 220.1 | 224.1 | 228.1 | 232.1 | 236.1 | 240.1 | 244.1 | 248.1 | 252.1 | 256.1 | 260.1 | 264.1 | 268.1 | 272.1 | 276.1 | 280.1 | 284.1 | 288.1 | 292.1 | 296.1 | 300.1 | 304.1 | 308.1 | 312.1 | 316.1 | | | | | |
| 14½ | 204.0 | 215.8 | 219.8 | 223.8 | 227.8 | 231.8 | 235.8 | 239.8 | 243.8 | 247.8 | 251.8 | 255.8 | 259.8 | 263.8 | 267.8 | 271.8 | 275.8 | 279.8 | 283.8 | 287.8 | 291.8 | 295.8 | 299.8 | 303.8 | 307.8 | 311.8 | 315.8 | 319.8 | | | | | |
| 14¾ | 207.5 | 219.5 | 223.5 | 227.5 | 231.5 | 235.5 | 239.5 | 243.5 | 247.5 | 251.5 | 255.5 | 259.5 | 263.5 | 267.5 | 271.5 | 275.5 | 279.5 | 283.5 | 287.5 | 291.5 | 295.5 | 299.5 | 303.5 | 307.5 | 311.5 | 315.5 | 319.5 | 323.5 | | | | | |
| 15 | 211.0 | 223.2 | 227.2 | 231.2 | 235.2 | 239.2 | 243.2 | 247.2 | 251.2 | 255.2 | 259.2 | 263.2 | 267.2 | 271.2 | 275.2 | 279.2 | 283.2 | 287.2 | 291.2 | 295.2 | 299.2 | 303.2 | 307.2 | 311.2 | 315.2 | 319.2 | 323.2 | 327.2 | | | | | |
| 15½ | 214.5 | 226.9 | 230.9 | 234.9 | 238.9 | 242.9 | 246.9 | 250.9 | 254.9 | 258.9 | 262.9 | 266.9 | 270.9 | 274.9 | 278.9 | 282.9 | 286.9 | 290.9 | 294.9 | 298.9 | 302.9 | 306.9 | 310.9 | 314.9 | 318.9 | 322.9 | 326.9 | 330.9 | | | | | |
| 15¾ | 218.0 | 230.6 | 234.6 | 238.6 | 242.6 | 246.6 | 250.6 | 254.6 | 258.6 | 262.6 | 266.6 | 270.6 | 274.6 | 278.6 | 282.6 | 286.6 | 290.6 | 294.6 | 298.6 | 302.6 | 306.6 | 310.6 | 314.6 | 318.6 | 322.6 | 326.6 | 330.6 | 334.6 | | | | | |
| 16 | 221.5 | 234.3 | 238.3 | 242.3 | 246.3 | 250.3 | 254.3 | 258.3 | 262.3 | 266.3 | 270.3 | 274.3 | 278.3 | 282.3 | 286.3 | 290.3 | 294.3 | 298.3 | 302.3 | 306.3 | 310.3 | 314.3 | 318.3 | 322.3 | 326.3 | 330.3 | 334.3 | 338.3 | | | | | |
| 16½ | 225.0 | 238.0 | 242.0 | 246.0 | 250.0 | 254.0 | 258.0 | 262.0 | 266.0 | 270.0 | 274.0 | 278.0 | 282.0 | 286.0 | 290.0 | 294.0 | 298.0 | 302.0 | 306.0 | 310.0 | 314.0 | 318.0 | 322.0 | 326.0 | 330.0 | 334.0 | 338.0 | 342.0 | | | | | |
| 16¾ | 228.5 | 241.7 | 245.7 | 249.7 | 253.7 | 257.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Piston Displacement Chart for All Six-Cylinder Engines of Any Bore and Stroke

Prepared by W. T. Hunt of the Packard Motor Car Co.

Stroke in Inches

| Bore Inches | 4 | 4 1/8 | 4 1/4 | 4 3/8 | 4 1/2 | 4 5/8 | 4 3/4 | 5 | 5 1/8 | 5 1/4 | 5 3/8 | 5 1/2 | 5 5/8 | 5 3/4 | 5 7/8 | 6 | 6 1/8 | 6 1/4 | 6 3/8 | 6 1/2 | 6 5/8 | 6 3/4 | 6 7/8 | 7 | 7 1/8 |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 2 1/2 | 117.8 | 121.5 | 125.2 | 128.9 | 132.5 | 136.2 | 139.9 | 143.6 | 147.2 | 150.9 | 154.6 | 158.3 | 162.0 | 165.7 | 169.3 | 173.0 | 176.7 | 180.4 | 184.1 | 187.7 | 191.4 | 195.1 | 198.8 | 202.5 | 206.2 |
| 2 5/8 | 123.8 | 127.6 | 131.5 | 135.4 | 139.2 | 143.1 | 147.0 | 150.8 | 154.7 | 158.6 | 162.5 | 166.3 | 170.2 | 174.1 | 177.9 | 181.8 | 185.7 | 189.5 | 193.4 | 197.3 | 201.1 | 205.0 | 208.9 | 212.7 | 216.6 |
| 2 3/4 | 129.9 | 133.9 | 137.9 | 141.9 | 145.9 | 149.9 | 153.9 | 157.9 | 161.9 | 165.9 | 169.9 | 173.9 | 177.9 | 181.9 | 185.9 | 189.9 | 193.9 | 197.9 | 201.9 | 205.9 | 209.9 | 213.9 | 217.9 | 221.9 | 225.9 |
| 2 7/8 | 136.1 | 140.4 | 144.7 | 148.9 | 153.2 | 157.4 | 161.7 | 165.9 | 170.2 | 174.4 | 178.7 | 182.9 | 187.2 | 191.5 | 195.7 | 200.0 | 204.3 | 208.6 | 212.9 | 217.2 | 221.5 | 225.8 | 230.1 | 234.4 | 238.7 |
| 2 3/4 | 142.6 | 147.1 | 151.5 | 155.9 | 160.3 | 164.7 | 169.1 | 173.5 | 177.9 | 182.3 | 186.7 | 191.1 | 195.5 | 199.9 | 204.3 | 208.7 | 213.1 | 217.5 | 221.9 | 226.3 | 230.7 | 235.1 | 239.5 | 243.9 | 248.3 |
| 2 1/2 | 149.1 | 153.8 | 158.4 | 163.1 | 167.7 | 172.4 | 177.0 | 181.7 | 186.4 | 191.0 | 195.7 | 200.4 | 205.0 | 209.7 | 214.3 | 219.0 | 223.7 | 228.3 | 233.0 | 237.6 | 242.3 | 246.9 | 251.6 | 256.3 | 260.9 |
| 2 5/8 | 155.8 | 160.7 | 165.5 | 170.4 | 175.3 | 180.1 | 185.0 | 189.9 | 194.8 | 199.6 | 204.5 | 209.4 | 214.2 | 219.1 | 224.0 | 228.8 | 233.7 | 238.6 | 243.4 | 248.3 | 253.2 | 258.1 | 262.9 | 267.8 | 272.5 |
| 2 3/4 | 162.7 | 167.7 | 172.8 | 177.9 | 183.0 | 188.1 | 193.1 | 198.2 | 203.3 | 208.4 | 213.5 | 218.6 | 223.6 | 228.7 | 233.8 | 238.9 | 244.0 | 249.1 | 254.1 | 259.2 | 264.3 | 269.4 | 274.5 | 279.6 | 284.7 |
| 3 | 169.6 | 174.9 | 180.2 | 185.5 | 190.8 | 196.1 | 201.4 | 206.7 | 212.0 | 217.3 | 222.6 | 227.9 | 233.2 | 238.5 | 243.8 | 249.1 | 254.4 | 259.7 | 265.0 | 270.3 | 275.6 | 280.9 | 286.2 | 291.5 | 296.8 |
| 3 1/8 | 176.8 | 182.3 | 187.8 | 193.4 | 198.9 | 204.4 | 209.9 | 215.4 | 220.9 | 226.4 | 231.9 | 237.4 | 242.9 | 248.4 | 253.9 | 259.4 | 264.9 | 270.4 | 275.9 | 281.4 | 286.9 | 292.4 | 297.9 | 303.4 | 308.9 |
| 3 1/4 | 184.1 | 189.8 | 195.6 | 201.3 | 207.1 | 212.8 | 218.6 | 224.4 | 230.1 | 235.9 | 241.6 | 247.4 | 253.1 | 258.9 | 264.6 | 270.4 | 276.1 | 281.9 | 287.6 | 293.4 | 299.1 | 304.9 | 310.6 | 316.4 | 322.2 |
| 3 1/2 | 191.5 | 197.5 | 203.5 | 209.5 | 215.4 | 221.4 | 227.4 | 233.4 | 239.4 | 245.4 | 251.4 | 257.3 | 263.3 | 269.3 | 275.3 | 281.3 | 287.3 | 293.2 | 299.2 | 305.2 | 311.2 | 317.2 | 323.2 | 329.1 | 335.1 |
| 3 3/4 | 206.8 | 213.3 | 219.8 | 226.2 | 232.7 | 239.1 | 245.6 | 252.1 | 258.5 | 265.0 | 271.5 | 277.9 | 284.4 | 290.8 | 297.3 | 303.8 | 310.2 | 316.7 | 323.2 | 329.7 | 336.2 | 342.7 | 349.2 | 355.7 | 362.2 |
| 3 1/2 | 214.7 | 221.4 | 228.1 | 234.8 | 241.5 | 248.2 | 254.9 | 261.6 | 268.3 | 275.0 | 281.7 | 288.4 | 295.1 | 301.8 | 308.5 | 315.2 | 321.9 | 328.6 | 335.3 | 342.0 | 348.7 | 355.4 | 362.1 | 368.8 | 375.5 |
| 3 1/4 | 222.7 | 229.7 | 236.7 | 243.6 | 250.6 | 257.5 | 264.5 | 271.5 | 278.5 | 285.4 | 292.3 | 299.3 | 306.3 | 313.2 | 320.2 | 327.1 | 334.1 | 341.1 | 348.0 | 355.0 | 362.0 | 369.0 | 376.0 | 383.0 | 389.9 |
| 3 1/2 | 230.9 | 238.1 | 245.3 | 252.6 | 259.8 | 267.0 | 274.2 | 281.4 | 288.6 | 295.9 | 303.1 | 310.3 | 317.5 | 324.7 | 331.9 | 339.2 | 346.4 | 353.6 | 360.8 | 368.0 | 375.2 | 382.4 | 389.7 | 396.9 | 404.1 |
| 3 3/4 | 239.2 | 246.7 | 254.2 | 261.7 | 269.1 | 276.6 | 284.1 | 291.6 | 299.0 | 306.4 | 313.8 | 321.2 | 328.6 | 336.0 | 343.4 | 350.8 | 358.2 | 365.6 | 373.0 | 380.4 | 387.8 | 395.2 | 402.6 | 410.0 | 417.4 |
| 3 1/2 | 247.4 | 255.2 | 262.9 | 270.6 | 278.4 | 286.1 | 293.8 | 301.6 | 309.3 | 317.0 | 324.8 | 332.5 | 340.3 | 348.0 | 355.7 | 363.5 | 371.2 | 378.9 | 386.7 | 394.4 | 402.1 | 409.9 | 417.6 | 425.3 | 433.1 |
| 3 3/8 | 256.3 | 264.3 | 272.3 | 280.3 | 288.4 | 296.4 | 304.4 | 312.4 | 320.4 | 328.4 | 336.4 | 344.4 | 352.4 | 360.4 | 368.4 | 376.4 | 384.4 | 392.4 | 400.4 | 408.4 | 416.4 | 424.4 | 432.4 | 440.4 | 448.4 |
| 3 1/4 | 265.1 | 273.4 | 281.7 | 290.0 | 298.2 | 306.5 | 314.8 | 323.1 | 331.4 | 339.7 | 347.9 | 356.2 | 364.5 | 372.8 | 381.1 | 389.4 | 397.6 | 405.9 | 414.2 | 422.5 | 430.8 | 439.1 | 447.4 | 455.6 | 463.8 |
| 3 1/2 | 274.0 | 282.5 | 291.1 | 299.7 | 308.2 | 316.8 | 325.4 | 334.0 | 342.5 | 351.0 | 359.6 | 368.2 | 376.7 | 385.3 | 393.8 | 402.4 | 411.0 | 419.5 | 428.1 | 436.7 | 445.2 | 453.8 | 462.3 | 470.9 | 479.5 |
| 3 3/4 | 283.0 | 291.8 | 300.7 | 309.5 | 318.4 | 327.2 | 336.1 | 345.0 | 353.9 | 362.8 | 371.6 | 380.5 | 389.4 | 398.3 | 407.2 | 416.1 | 425.0 | 433.9 | 442.8 | 451.7 | 460.6 | 469.5 | 478.4 | 487.3 | 496.2 |
| 3 1/2 | 292.2 | 301.3 | 310.5 | 319.6 | 328.7 | 337.9 | 347.0 | 356.1 | 365.3 | 374.4 | 383.5 | 392.7 | 401.8 | 410.9 | 420.1 | 429.2 | 438.3 | 447.5 | 456.6 | 465.7 | 474.9 | 484.0 | 493.1 | 502.3 | 511.4 |
| 4 | 301.6 | 311.0 | 320.4 | 329.9 | 339.3 | 348.7 | 358.1 | 367.6 | 377.0 | 386.4 | 395.8 | 405.3 | 414.7 | 424.1 | 433.5 | 443.0 | 452.4 | 461.8 | 471.2 | 480.7 | 490.1 | 499.5 | 508.9 | 518.4 | 527.8 |
| 4 1/8 | 311.1 | 320.8 | 330.5 | 340.3 | 350.0 | 359.8 | 369.4 | 379.1 | 388.9 | 398.6 | 408.3 | 418.0 | 427.6 | 437.3 | 447.2 | 456.9 | 466.6 | 476.4 | 486.1 | 495.8 | 505.5 | 515.3 | 525.0 | 534.7 | 544.4 |
| 4 1/4 | 320.7 | 330.8 | 340.8 | 350.8 | 360.8 | 370.8 | 380.9 | 390.9 | 400.9 | 410.9 | 420.9 | 430.9 | 440.9 | 450.9 | 461.1 | 471.1 | 481.1 | 491.1 | 501.2 | 511.2 | 521.2 | 531.2 | 541.2 | 551.3 | 561.3 |
| 4 1/2 | 330.5 | 340.9 | 351.2 | 361.5 | 371.8 | 382.2 | 392.5 | 402.8 | 413.1 | 423.5 | 433.8 | 444.1 | 454.5 | 464.8 | 475.1 | 485.5 | 495.8 | 506.1 | 516.5 | 526.8 | 537.1 | 547.4 | 557.7 | 568.1 | 578.4 |
| 4 3/4 | 340.5 | 351.1 | 361.8 | 372.4 | 383.0 | 393.7 | 404.3 | 415.0 | 425.6 | 436.2 | 446.9 | 457.5 | 468.2 | 478.8 | 489.4 | 500.1 | 510.7 | 521.4 | 532.0 | 542.6 | 553.3 | 563.9 | 574.6 | 585.2 | 595.8 |
| 4 1/2 | 350.6 | 361.5 | 372.5 | 383.4 | 394.4 | 405.3 | 416.3 | 427.2 | 438.2 | 449.1 | 460.1 | 471.1 | 482.0 | 493.0 | 503.9 | 514.9 | 525.8 | 536.8 | 547.7 | 558.7 | 569.6 | 580.6 | 591.5 | 602.5 | 613.5 |
| 4 1/4 | 360.8 | 372.1 | 383.3 | 394.6 | 405.9 | 417.2 | 428.4 | 439.7 | 451.0 | 462.3 | 473.5 | 484.8 | 496.1 | 507.4 | 518.6 | 529.9 | 541.2 | 552.5 | 563.7 | 575.0 | 586.3 | 597.6 | 608.9 | 620.1 | 631.4 |
| 4 1/2 | 371.2 | 382.8 | 394.4 | 406.0 | 417.6 | 429.2 | 440.8 | 452.4 | 464.0 | 475.6 | 487.2 | 498.8 | 510.4 | 522.0 | 533.6 | 545.2 | 556.8 | 568.4 | 580.0 | 591.6 | 603.2 | 614.8 | 626.4 | 638.0 | 649.6 |
| 4 3/4 | 381.7 | 393.6 | 405.6 | 417.5 | 429.4 | 441.3 | 453.3 | 465.2 | 477.1 | 489.1 | 501.0 | 512.9 | 524.8 | 536.8 | 548.7 | 560.6 | 572.5 | 584.5 | 596.4 | 608.3 | 620.3 | 632.2 | 644.1 | 656.0 | 667.9 |
| 4 1/2 | 392.4 | 404.6 | 416.9 | 429.2 | 441.4 | 453.7 | 466.0 | 478.3 | 490.6 | 502.9 | 515.2 | 527.5 | 539.8 | 552.1 | 564.4 | 576.7 | 589.0 | 601.3 | 613.6 | 625.9 | 638.2 | 650.5 | 662.8 | 675.1 | 687.4 |
| 4 3/4 | 403.2 | 415.8 | 428.4 | 441.0 | 453.6 | 466.2 | 478.8 | 491.4 | 504.0 | 516.6 | 529.2 | 541.8 | 554.4 | 567.0 | 579.6 | 592.2 | 604.8 | 617.4 | 630.0 | 642.6 | 655.2 | 667.8 | 680.4 | 693.0 | 705.6 |
| 4 1/2 | 414.2 | 427.1 | 440.1 | 453.0 | 465.9 | 478.8 | 491.7 | 504.6 | 517.5 | 530.4 | 543.3 | 556.2 | 569.1 | 582.0 | 594.9 | 607.8 | 620.7 | 633.6 | 646.5 | 659.4 | 672.3 | 685.2 | 698.1 | 711.0 | 723.9 |
| 4 3/4 | 425.3 | 438.6 | 451.9 | 465.2 | 478.5 | 491.8 | 505.1 | 518.4 | 531.7 | 545.0 | 558.3 | 571.6 | 584.9 | 598.2 | 611.5 | 624.8 | 638.1 | 651.4 | 664.7 | 678.0 | 691.3 | 704.6 | 717.9 | 731.2 | 744.5 |
| 4 1/2 | 436.6 | 450.2 | 463.8 | 477.5 | 491.1 | 504.8 | 518.5 | 532.2 | 545.9 | 559.6 | 573.3 | 587.0 | 600.7 | 614.4 | 628.1 | 641.8 | 655.5 | 669.2 | 682.9 | 696.6 | 710.3 | 724.0 | 737.7 | 751.4 | 765.1 |
| 4 3/4 | 448.0 | 462.0 | 476.0 | 490.0 | 504.0 | 518.0 | 532.0 | 546.0 | 560.0 | 574.0 | 588.0 | 602.0 | 616.0 | 630.0 | 644.0 | 658.0 | 672.0 | 686.0 | 700.0 | 714.0 | 728.0 | 742.0 | 756.0 | 770.0 | 784.0 |
| 4 1/2 | 459.5 | 473.9 | 488.3 | 502.6 | 517.0 | 531.3 | 545.7 | 560.1 | 574.4 | 588.8 | 603.1 | 617.5 | 631.9 | 646.2 | 660.6 | 675.0 | 689.3 | 703.7 | 718.0 | 732.4 | 746.7 | 761.1 | 775.5 | 789.8 | 804.2 |
| 5 | 471.2 | 486.0 | 500.7 | 515.4 | 530.1 | 544.9 | 559.6 | 574.3 | 589.0 | 603.8 | 618.5 | 633.2 | 648.0 | 662.7 | 677.4 | 692.1 | 706.9 | 721.6 | 736.3 | 751.0 | 765.8 | 780.5 | 795.2 | 810.0 | 824.7 |
| 5 1/8 | 483.1 | 498.2 | 513.3 | 528.4 | 543.5 | 558.6 | 573.7 | 588.8 | 603.9 | 619.0 | 634.1 | 649.2 | 664.3 | 679.4 | 694.5 | 709.6 | 724.7 | 739.7 | 754.8 | 769.9 | 785.0 | 800.1 | 815.2 | 830.3 | 845.4 |
| 5 1/4 | 495.1 | 510.6 | 526.0 | 541.5 | 557.0 | 572.5 | 587.9 | 603.4 | 618.9 | 634.4 | 649.9 | 665.4 | 680.9 | 696.4 | 711.9 | 727.4 | 742.9 | 758.4 | 773.9 | 789.4 | 804.9 | 820.4 | 835.9 | 851.4 | 866.9 |
| 5 1/2 | 507.2 | 523.1 | 538.9 | 554.8 | 570.6 | 586.5 | 602.4 | 618.2 | 634.1 | 649.9 | 665.8 | 681.6 | 697.5 | 713.3 | 729.2 | 745.0 | 760.9 | 776.7 | 792.6 | 808.4 | 824.3 | 840.1 | 856.0 | 871.8 | 887.7 |
| 5 3/4 | 519.5 | 535.8 | 552.0 | 568.3 | 584.5 | 600.7 | 617.0 | 633.2 | 649.4 | 665.7 | 681.9 | 698.1 | 714.4 | 730.6 | 746.8 | 763.1 | 779.3 | 795.6 | 811.8 | 828.0 | 844.3 | 860.5 | 876.7 | 893.0 | 909.2 |
| 5 1/2 | 532.0 | 548.6 | 565.2 | 581.9 | 598.5 | 615.1 | 631.7 | 648.4 | 665.0 | 681.6 | 698.2 | 714.8 | 731.4 | 748.0 | 764.6 | | | | | | | | | | |

Capacity of Eight-Cylinder Motors in Cubic Inches

Calculated for Bores Between $2\frac{1}{2}$ and 5 Inches, with Strokes from $2\frac{1}{2}$ to $6\frac{1}{2}$ Inches

| | | BORE—INCHES | | | | | | | | | | | | | | | | | | | |
|---------------|--|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| STROKE—INCHES | | 2½ | 2⅝ | 2⅞ | 2⅞ | 2⅞ | 2⅞ | 2⅞ | 2⅞ | 3 | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ |
| | | 2½ | 2⅝ | 2⅞ | 2⅞ | 2⅞ | 2⅞ | 2⅞ | 2⅞ | 3 | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ | 3⅛ |
| 2½ | | 98.2 | 103.1 | 108.2 | 113.4 | 118.8 | 124.2 | 129.8 | 135.5 | | | | | | | | | | | | |
| 2⅝ | | 103.1 | 108.3 | 113.6 | 119.1 | 124.7 | 130.4 | 136.3 | 142.3 | | | | | | | | | | | | |
| 2⅞ | | 108.0 | 113.4 | 119.0 | 124.8 | 130.6 | 136.7 | 142.8 | 149.1 | | | | | | | | | | | | |
| 2⅞ | | 112.9 | 118.6 | 124.5 | 130.4 | 136.8 | 142.9 | 149.3 | 155.9 | | | | | | | | | | | | |
| 3 | | 117.8 | 123.8 | 129.9 | 136.1 | 142.5 | 149.1 | 155.8 | 162.6 | 169.6 | 176.8 | 184.1 | 191.5 | 199.1 | 206.8 | 214.7 | 222.7 | 230.9 | | | |
| 3⅛ | | 122.7 | 128.9 | 135.3 | 141.8 | 148.5 | 155.3 | 162.3 | 169.4 | 176.7 | 184.1 | 191.7 | 199.5 | 207.4 | 215.4 | 223.6 | 232.0 | 240.5 | | | |
| 3⅛ | | 127.6 | 134.1 | 140.7 | 147.5 | 154.4 | 161.5 | 168.8 | 176.2 | 183.8 | 191.5 | 199.4 | 207.5 | 215.7 | 224.0 | 232.6 | 241.3 | 250.1 | | | |
| 3⅞ | | 132.5 | 139.2 | 146.1 | 153.1 | 160.3 | 167.7 | 175.3 | 183.0 | 190.8 | 198.9 | 207.2 | 215.4 | 224.0 | 232.7 | 241.5 | 250.6 | 259.7 | | | |
| 3⅞ | | 137.4 | 144.4 | 151.5 | 158.8 | 166.3 | 173.9 | 181.8 | 189.7 | 197.9 | 206.2 | 214.7 | 223.4 | 232.3 | 241.3 | 250.5 | 259.8 | 269.4 | 279.1 | 288.9 | 299.0 |
| 3⅞ | | 142.3 | 149.5 | 156.9 | 164.5 | 172.2 | 180.1 | 188.2 | 196.5 | 205.0 | 213.6 | 222.4 | 231.4 | 240.6 | 249.9 | 259.4 | 269.1 | 279.0 | 289.1 | 299.3 | 309.7 |
| 3⅞ | | 147.2 | 154.7 | 162.3 | 170.1 | 178.2 | 186.4 | 194.7 | 203.3 | 212.0 | 221.0 | 230.1 | 239.4 | 248.9 | 258.5 | 268.4 | 278.4 | 288.6 | 299.0 | 309.6 | 320.4 |
| 3⅞ | | 152.2 | 159.8 | 167.7 | 175.8 | 184.1 | 192.6 | 201.2 | 210.1 | 219.1 | 228.3 | 237.7 | 247.4 | 257.1 | 267.1 | 277.3 | 287.6 | 298.2 | 309.0 | 319.9 | 331.0 |
| 4 | | 157.1 | 165.0 | 173.2 | 181.5 | 190.0 | 198.8 | 207.7 | 216.8 | 226.2 | 235.7 | 245.4 | 255.3 | 265.4 | 275.8 | 286.3 | 296.9 | 307.9 | 319.0 | 330.2 | 341.7 |
| 4⅛ | | 161.9 | 170.2 | 178.6 | 187.2 | 196.0 | 205.0 | 214.2 | 223.6 | 233.2 | 243.1 | 253.1 | 263.3 | 273.7 | 284.4 | 295.2 | 306.2 | 317.5 | 328.9 | 340.5 | 352.4 |
| 4⅛ | | 166.9 | 175.3 | 184.0 | 192.8 | 201.9 | 211.2 | 220.7 | 230.4 | 240.3 | 250.4 | 260.8 | 271.3 | 282.0 | 293.0 | 304.2 | 315.5 | 327.1 | 338.9 | 350.9 | 363.1 |
| 4⅛ | | 171.8 | 180.5 | 189.4 | 198.5 | 207.9 | 217.4 | 227.2 | 237.2 | 247.4 | 257.8 | 268.4 | 279.3 | 290.3 | 301.6 | 313.1 | 324.7 | 336.7 | 348.9 | 361.2 | 373.7 |
| 4⅛ | | 176.7 | 185.6 | 194.8 | 204.2 | 213.8 | 223.6 | 233.7 | 243.9 | 254.4 | 265.2 | 276.1 | 287.3 | 298.6 | 310.2 | 322.0 | 334.0 | 346.3 | 358.8 | 371.5 | 384.4 |
| 4⅛ | | 181.6 | 190.8 | 200.2 | 209.9 | 219.7 | 229.8 | 240.2 | 250.7 | 261.5 | 272.5 | 283.8 | 295.2 | 306.9 | 318.8 | 331.0 | 343.3 | 356.0 | 368.8 | 381.8 | 395.1 |
| 4⅛ | | 186.5 | 195.9 | 205.6 | 215.5 | 225.7 | 236.1 | 246.7 | 257.5 | 268.6 | 279.9 | 291.4 | 303.2 | 315.2 | 327.5 | 339.9 | 352.6 | 365.6 | 378.8 | 392.1 | 405.8 |
| 4⅛ | | 191.4 | 201.1 | 211.0 | 221.2 | 231.8 | 242.3 | 253.2 | 264.3 | 275.7 | 287.3 | 299.1 | 311.2 | 323.5 | 336.1 | 348.9 | 361.9 | 375.2 | 388.7 | 402.5 | 416.5 |
| 5 | | 196.3 | 206.3 | 216.5 | 226.9 | 237.6 | 248.5 | 259.7 | 271.1 | 282.7 | 294.6 | 306.8 | 319.2 | 331.8 | 344.7 | 357.8 | 371.1 | 384.8 | 398.7 | 412.8 | 427.1 |
| 5⅛ | | 201.2 | 211.4 | 221.9 | 232.5 | 243.5 | 254.7 | 266.1 | 277.8 | 289.8 | 302.0 | 314.4 | 327.2 | 340.1 | 353.3 | 366.8 | 380.4 | 394.4 | 408.7 | 423.1 | 437.8 |
| 5⅛ | | 206.1 | 216.6 | 227.3 | 238.2 | 249.4 | 260.9 | 272.6 | 284.6 | 296.9 | 309.4 | 322.1 | 335.1 | 348.4 | 361.9 | 375.7 | 389.7 | 404.1 | 418.6 | 433.4 | 448.5 |
| 5⅛ | | 211.1 | 221.7 | 232.7 | 243.9 | 255.4 | 267.1 | 279.1 | 291.4 | 303.9 | 316.7 | 329.8 | 343.1 | 356.7 | 370.6 | 384.7 | 399.0 | 413.7 | 428.6 | 443.7 | 459.2 |
| 5⅛ | | 215.9 | 226.9 | 238.1 | 249.6 | 261.3 | 273.3 | 285.6 | 298.2 | 311.0 | 324.1 | 337.5 | 351.1 | 365.0 | 379.2 | 393.6 | 408.2 | 423.3 | 438.6 | 454.1 | 469.9 |
| 5⅛ | | 220.9 | 232.2 | 243.5 | 255.2 | 267.3 | 279.5 | 292.1 | 304.9 | 318.1 | 331.5 | 345.1 | 359.1 | 373.3 | 387.8 | 402.6 | 417.5 | 432.9 | 448.5 | 464.4 | 480.5 |
| 5⅛ | | 225.8 | 237.2 | 248.9 | 260.9 | 273.2 | 285.8 | 298.6 | 311.7 | 325.1 | 338.8 | 352.8 | 367.1 | 381.6 | 396.4 | 411.5 | 426.8 | 442.6 | 458.5 | 474.7 | 491.2 |
| 5⅛ | | 230.7 | 242.4 | 254.3 | 266.6 | 279.1 | 292.0 | 305.1 | 318.5 | 332.2 | 346.2 | 360.5 | 375.0 | 389.9 | 405.0 | 420.5 | 436.1 | 452.2 | 468.5 | 485.0 | 501.9 |
| 6 | | 235.6 | 247.5 | 259.8 | 272.3 | 285.1 | 298.2 | 311.6 | 325.3 | 339.3 | 353.6 | 368.1 | 383.0 | 398.2 | 413.6 | 429.4 | 445.4 | 461.8 | 478.4 | 495.3 | 512.6 |
| 6⅛ | | 240.5 | 252.7 | 265.2 | 277.9 | 291.0 | 304.4 | 318.1 | 332.1 | 346.3 | 360.9 | 375.8 | 391.0 | 406.5 | 422.3 | 438.4 | 454.7 | 471.4 | 488.4 | 505.7 | 523.3 |
| 6⅛ | | 245.4 | 257.8 | 270.6 | 283.6 | 296.9 | 310.6 | 324.6 | 338.8 | 353.4 | 368.3 | 383.5 | 399.0 | 414.8 | 430.9 | 447.3 | 463.9 | 481.0 | 498.4 | 516.0 | 533.9 |
| 6⅛ | | 250.3 | 263.0 | 276.0 | 289.3 | 302.9 | 316.8 | 331.1 | 345.6 | 360.5 | 375.6 | 391.1 | 406.9 | 423.1 | 439.5 | 456.2 | 473.2 | 490.7 | 508.3 | 526.3 | 544.6 |
| 6⅛ | | 255.2 | 268.2 | 281.4 | 294.9 | 308.8 | 323.0 | 337.6 | 352.4 | 367.5 | 383.0 | 398.8 | 414.9 | 431.4 | 448.1 | 465.2 | 482.5 | 500.3 | 518.3 | 536.6 | 555.3 |
| STROKE—INCHES | | | | | | | | | | | | | | | | | | | | 5 | |
| | | 3⅛ | 3⅛ | 3⅛ | 4 | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 4⅛ | 5 | |
| 3⅛ | | 319.6 | 330.2 | 340.9 | | | | | | | | | | | | | | | | | |
| 3⅛ | | 331.0 | 342.0 | 353.1 | | | | | | | | | | | | | | | | | |
| 3⅛ | | 342.5 | 353.8 | 365.3 | | | | | | | | | | | | | | | | | |
| 3⅛ | | 353.9 | 365.6 | 377.5 | | | | | | | | | | | | | | | | | |
| 4 | | 365.3 | 377.4 | 389.8 | 402.1 | 414.8 | 427.6 | 440.7 | 453.9 | 467.4 | 481.0 | 494.9 | | | | | | | | | |
| 4⅛ | | 376.7 | 389.1 | 401.8 | 414.7 | 427.7 | 441.0 | 454.5 | 468.1 | 482.0 | 496.1 | 510.3 | | | | | | | | | |
| 4⅛ | | 388.1 | 400.9 | 414.0 | 427.2 | 440.7 | 454.4 | 468.2 | 482.3 | 496.6 | 511.1 | 525.8 | | | | | | | | | |
| 4⅛ | | 399.5 | 412.7 | 426.2 | 439.8 | 453.7 | 467.7 | 482.0 | 496.5 | 511.2 | 526.1 | 541.3 | | | | | | | | | |
| 4⅛ | | 411.0 | 424.5 | 438.4 | 452.4 | 466.8 | 481.1 | 495.8 | 510.7 | 525.8 | 541.2 | 556.7 | 572.5 | 588.5 | 604.8 | 621.2 | 637.9 | 654.8 | 671.9 | 689.2 | 706.8 |
| 4⅛ | | 422.4 | 436.3 | 450.5 | 464.9 | 479.8 | 494.4 | 509.5 | 524.9 | 540.4 | 556.2 | 572.2 | 588.4 | 604.9 | 621.8 | 638.5 | 655.6 | 673.0 | 690.6 | 708.4 | 726.5 |
| 4⅛ | | 433.8 | 448.1 | 462.7 | 477.5 | 492.5 | 507.8 | 523.3 | 539.0 | 555.0 | 571.2 | 587.7 | 604.3 | 621.2 | 638.4 | 655.7 | 673.3 | 691.2 | 709.3 | 727.6 | 746.1 |
| 4⅛ | | 445.2 | 459.9 | 474.9 | 490.1 | 505.5 | 521.2 | 537.1 | 553.2 | 569.6 | 586.3 | 603.1 | 620.2 | 637.6 | 655.2 | 673.0 | 691.1 | 709.4 | 727.9 | 746.7 | 765.7 |
| 5 | | 456.6 | 471.7 | 487.1 | 502.8 | 518.7 | 534.5 | 550.9 | 567.4 | 584.2 | 601.3 | 618.6 | 636.1 | 653.9 | 672.0 | 690.3 | 708.8 | 727.6 | 746.6 | 765.9 | 785.4 |
| 5⅛ | | 468.0 | 483.5 | 499.2 | 515.2 | 531.4 | 547.9 | 564.6 | 581.6 | 598.8 | 616.3 | 634.0 | 652.0 | 670.3 | 688.8 | 707.5 | 726.5 | 745.8 | 765.2 | 785.0 | 805.0 |
| 5⅛ | | 479.5 | 495.3 | 511.4 | 527.8 | 544.4 | 561.3 | 578.4 | 595.8 | 613.4 | 631.4 | 649.5 | 667.9 | 686.6 | 705.6 | 724.8 | 744.2 | 764.0 | 783.9 | 804.2 | 824.7 |
| 5⅛ | | 490.9 | 507.1 | 523.6 | 540.3 | 557.3 | 574.6 | 592.2 | 610.0 | 628.0 | 646.4 | 665.0 | 683.9 | 703.0 | 722.4 | 742.0 | 761.9 | 782.2 | 802.6 | 823.3 | 844.3 |
| 5⅛ | | 502.3 | 518.9 | 535.8 | 552.9 | 570.3 | 588.0 | 605.9 | 624.2 | 642.6 | 661.4 | 680.4 | 699.8 | 719.3 | 739.2 | 759.3 | 779.7 | 800.3 | 821.2 | 842.4 | 863.9 |
| 5⅛ | | 513.7 | 530.7 | 547.9 | 565.5 | 583.3 | 601.4 | 6 | | | | | | | | | | | | | |

Piston Displacement Chart for Twelve-Cylinder Engine, Any Bore and Stroke

Bore—Inches

| | 2 1/8 | 2 1/4 | 2 3/8 | 2 1/2 | 2 5/8 | 2 3/4 | 2 7/8 | 3 | 3 1/8 | 3 1/4 | 3 3/8 | 3 1/2 | 3 5/8 | 3 3/4 | 3 7/8 | 4 | 4 1/8 | 4 1/4 | 4 3/8 | 4 1/2 | 4 5/8 | 4 3/4 | 4 7/8 | 5 | 5 1/8 | 5 1/4 | 5 3/8 | 5 1/2 | 5 5/8 | 5 3/4 | 5 7/8 | 6 |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|-------|-------|-------|-------|-------|-------|-------|---|-------|-------|-------|-------|-------|-------|-------|---|
| 2 1/8 | 107.3 | 113.4 | 119.2 | 127.0 | 132.5 | 139.2 | 146.1 | 153.1 | 160.3 | 167.7 | 175.3 | 183.0 | | | | | | | | | | | | | | | | | | | | |
| 2 1/4 | 113.3 | 119.7 | 125.6 | 134.1 | 140.0 | 147.0 | 154.2 | 161.6 | 169.3 | 177.1 | 185.0 | 193.1 | | | | | | | | | | | | | | | | | | | | |
| 2 3/8 | 119.3 | 126.0 | 132.1 | 141.2 | 147.2 | 154.7 | 162.3 | 170.2 | 178.2 | 186.4 | 194.8 | 203.3 | | | | | | | | | | | | | | | | | | | | |
| 2 1/2 | 125.2 | 132.3 | 138.5 | 148.2 | 154.6 | 162.4 | 170.4 | 178.7 | 187.1 | 195.7 | 204.5 | 213.5 | | | | | | | | | | | | | | | | | | | | |
| 2 5/8 | 131.2 | 138.6 | 145.0 | 155.3 | 162.0 | 170.2 | 178.6 | 187.2 | 196.0 | 205.0 | 214.2 | 223.6 | | | | | | | | | | | | | | | | | | | | |
| 2 3/4 | 137.2 | 144.9 | 151.4 | 162.3 | 169.3 | 177.9 | 186.7 | 195.7 | 205.0 | 214.3 | 223.9 | 233.8 | | | | | | | | | | | | | | | | | | | | |
| 3 | 143.1 | 151.2 | 157.9 | 169.4 | 176.7 | 185.6 | 194.8 | 204.2 | 213.8 | 223.7 | 233.7 | 243.9 | 254.4 | | | | | | | | | | | | | | | | | | | |
| 3 1/8 | 149.1 | 157.5 | 164.3 | 176.5 | 184.1 | 193.4 | 202.9 | 212.7 | 222.7 | 233.0 | 243.4 | 254.1 | 275.0 | | | | | | | | | | | | | | | | | | | |
| 3 1/4 | 155.1 | 163.8 | 170.7 | 183.5 | 191.4 | 201.1 | 211.0 | 221.2 | 231.6 | 242.3 | 253.2 | 264.3 | 275.6 | 286.2 | | | | | | | | | | | | | | | | | | |
| 3 3/8 | 161.0 | 170.1 | 177.2 | 190.6 | 198.8 | 208.8 | 219.1 | 229.7 | 240.5 | 251.6 | 262.9 | 274.5 | 286.2 | 296.8 | 307.4 | | | | | | | | | | | | | | | | | |
| 3 1/2 | 167.0 | 176.4 | 183.6 | 197.6 | 206.2 | 216.6 | 227.2 | 238.2 | 249.4 | 261.0 | 272.7 | 284.6 | 296.8 | 307.4 | 318.0 | | | | | | | | | | | | | | | | | |
| 3 5/8 | 173.0 | 182.7 | 190.1 | 204.7 | 213.5 | 224.3 | 235.3 | 246.7 | 258.3 | 270.3 | 282.4 | 294.8 | 307.4 | 318.0 | 328.5 | | | | | | | | | | | | | | | | | |
| 3 3/4 | 178.9 | 189.0 | 196.5 | 211.7 | 220.8 | 232.0 | 243.4 | 255.2 | 267.3 | 279.6 | 292.1 | 304.9 | 315.1 | 328.5 | 339.2 | | | | | | | | | | | | | | | | | |
| 4 | 184.9 | 195.3 | 203.0 | 218.8 | 228.2 | 239.8 | 251.6 | 263.7 | 276.2 | 288.9 | 301.9 | 315.1 | 328.5 | 339.2 | 349.8 | | | | | | | | | | | | | | | | | |
| 4 1/8 | 190.8 | 201.6 | 209.4 | 225.9 | 235.6 | 247.5 | 259.7 | 272.2 | 285.1 | 298.2 | 311.6 | 325.2 | 335.4 | 349.8 | 360.4 | | | | | | | | | | | | | | | | | |
| 4 1/4 | 196.8 | 207.9 | 215.9 | 232.9 | 243.0 | 255.3 | 267.8 | 280.7 | 294.0 | 307.6 | 321.3 | 335.4 | 345.6 | 360.4 | 371.0 | | | | | | | | | | | | | | | | | |
| 4 3/8 | 202.7 | 214.2 | 222.3 | 239.9 | 250.3 | 263.0 | 275.9 | 289.3 | 303.0 | 316.9 | 331.0 | 345.6 | 355.8 | 371.0 | 386.8 | | | | | | | | | | | | | | | | | |
| 4 1/2 | 208.7 | 220.5 | 228.7 | 247.0 | 257.7 | 270.7 | 284.0 | 297.8 | 311.8 | 326.2 | 340.8 | 355.8 | 365.9 | 381.6 | 397.8 | | | | | | | | | | | | | | | | | |
| 4 5/8 | 214.7 | 226.8 | 235.2 | 254.1 | 265.0 | 278.5 | 292.1 | 306.3 | 320.7 | 335.6 | 350.5 | 365.9 | 376.1 | 392.2 | 408.8 | | | | | | | | | | | | | | | | | |
| 4 3/4 | 220.6 | 233.1 | 241.6 | 261.2 | 272.4 | 286.2 | 300.2 | 314.8 | 329.6 | 344.9 | 360.3 | 376.1 | 386.3 | 402.8 | 419.8 | | | | | | | | | | | | | | | | | |
| 4 7/8 | 226.6 | 239.4 | 248.1 | 268.4 | 279.8 | 293.9 | 308.3 | 323.2 | 338.5 | 354.2 | 370.0 | 386.3 | 402.8 | 419.8 | 437.2 | | | | | | | | | | | | | | | | | |
| 5 | 232.6 | 245.7 | 254.5 | 275.3 | 287.1 | 301.7 | 316.5 | 331.8 | 347.4 | 363.5 | 379.8 | 396.4 | 413.4 | 431.0 | 448.6 | | | | | | | | | | | | | | | | | |
| 5 1/8 | 238.5 | 252.0 | 260.9 | 282.3 | 294.5 | 309.4 | 324.6 | 340.3 | 356.3 | 372.8 | 389.5 | 406.6 | 424.2 | 442.0 | 460.2 | | | | | | | | | | | | | | | | | |
| 5 1/4 | 244.5 | 258.3 | 267.4 | 289.4 | 301.8 | 317.1 | 332.7 | 348.8 | 365.2 | 382.2 | 399.2 | 416.8 | 434.8 | 453.0 | 471.8 | | | | | | | | | | | | | | | | | |
| 5 3/8 | 245.5 | 264.6 | 273.8 | 296.4 | 309.2 | 324.9 | 340.8 | 357.3 | 374.2 | 391.5 | 408.9 | 426.9 | 445.4 | 464.0 | 483.2 | | | | | | | | | | | | | | | | | |
| 5 1/2 | 270.9 | 280.3 | 290.5 | 316.6 | 332.6 | 348.9 | 365.8 | 383.1 | 400.8 | 418.7 | 437.1 | 456.0 | 475.2 | 494.8 | 514.6 | | | | | | | | | | | | | | | | | |
| 5 3/4 | 277.2 | 286.7 | 296.7 | 323.9 | 340.3 | 357.0 | 374.3 | 392.0 | 410.2 | 428.4 | 447.3 | 466.6 | 486.2 | 506.2 | 526.6 | | | | | | | | | | | | | | | | | |
| 5 7/8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Stroke—Inches



The Motor Car Repair Shop



The Delicate Adjusting of Axle Gears

WHEN the rear axle gets noisy and emits all sorts of howls and groans, you can rest assured that it is out of adjustment in nine cases out of ten. There are several conditions that may arise to cause a noisy rear unit, among them being the location of the ring gear with respect to the pinion, too much play in the gears, or play in a bearing. Improper meshing of the gears is the most usual cause of axle noise.

To make up for imperfections in the cutting of gears, which are found in all gears made, a very minute distance is allowed between the teeth, called backlash. This permits the gears to mesh smoothly and is necessary for quiet running. Referring to sketch, Fig. 1, the meaning of backlash is made clear. A shows two gears improperly adjusted with no backlash, while B indicates correct mesh with a backlash not over .005 to .006 inch. In the gearing of a rear axle, the heel of both the ring gear and the bevel pinion must be flush. There will be noise if the gear or the pinion is meshed deeper than the other. Fig. 2 shows proper mesh. Fig. 3 shows the gear too deeply into the pinion, and Fig. 4 indicates the condition when the pinion is too deeply set.

Two Bearing Bevel Pinion

In nearly every axle construction there are two bearings for the bevel pinion shaft, one just back of the pinion, and the other still further back, these positions being applied when the axle is in its normal place and you are facing it and looking toward the front of the car. Then the bevel ring gear within which are the differential gears is mounted on two bearings, one at either side. It is possible to move the pinion back and forward a slight amount by the adjustments provided for the two bearings, and there is also always provision for moving the ring gear and differential to the right or left a slight amount. Then play in any one of the four bearings mentioned can also be taken up individually without disturbing the positions of the gears with respect to one another.

With this understanding of the general subject of axle adjustment, let us refer to several designs as found on representative cars, and apply what we have already learned about adjustments in general. In going into this, Motor Age is fully aware that it is work which is of a delicate nature, and should not be undertaken by every one, unless familiar with mechanical matters and adept at repair work.

Take as a typical example, the axle used in Hudson cars. This axle is shown in section in Fig. 5. The points of adjustment

are also indicated. The first thing to do in adjusting is to take out the inspection plug, and examine the mesh of the gear and pinion. In this axle, as in most designs, there are locks that hold the adjusting nuts in position after they once have been set correctly. Naturally the lock must be disengaged before the adjustment can be made.

Start with the pinion. If there is end play in the pinion shaft, it can be taken up by tightening the pinion adjusting nut that acts on the front bearing. This is the inner one. Screw it toward the right when looking at the axle from the rear. When turning the front nut, the outer

do this, it is easy to line up the slots in the two nuts, then by turning them together toward the left you bring them deeper into mesh with the gear, and to the right, you pull the pinion away from the gear. These directions apply when you are facing the axle from the rear.

Now suppose there is play in the ring gear or its bearings. It is first necessary to remove the rear plate of the axle housing when the bearing mountings are readily accessible. The adjusting nuts on either side of the gear also are locked. First take off the locks, which are simply little pieces of steel which are fastened into one of the slots of either nut to prevent it turning.

This action frees the adjusting nuts, but the bearing caps are on tightly, and these should first be loosened by backing off the cap nuts a little. Then the ring gear and differential unit may be moved without any hampering influence. By backing off the right adjusting nut slightly, turning it in a counterclockwise direction, and taking up on the left nut the same amount, you move the whole unit to the left, or away from the pinion. Reversing the operation brings the ring gear to the right or closer to the pinion. Any play in either bearing is taken up by moving the adjusting nut the correct way individually.

Studebaker Rear Axle

Take another instance, the Studebaker rear axle, which is shown in perspective in Fig. 6. First take out the drive shafts and the cover for the rear of the housing. As in the other case, there are locks E for the adjusting nuts, F and G. So, first take out the clamping bolts D and remove the locks.

If the ring gear is meshed too deep into the pinion, turn the adjusting nut off slightly and tighten up on the right adjusting nut G the same amount. This will shift the gear to the left, when you are looking at the axle from the rear, and will leave a certain amount of clearance between pinion and gear. Now the pinion adjusting nut H should be turned to the right to take up the clearance just made. If the pinion is meshed too deeply, then the reverse of the above procedure should be followed until the heels of both gears are flush.

In the Studebaker axle, the locking of the pinion adjustment is a little different, and it probably would be well to mention this. There is a locking set screw on the top of the gearcase just back of the cover, and this must be loosened first. End play in the pinion is taken out by means of the adjusting nut C, which is locked by

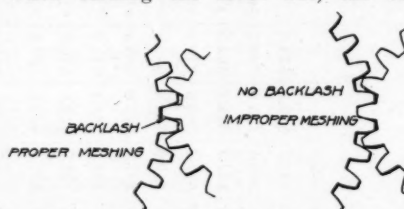


FIG. 1—ILLUSTRATING BACKLASH

This shows a properly adjusted gear and one improperly meshed

one, which acts against the rear bearing of the pinion shaft, should be held stationary. These two adjusting nuts obviously screw in opposite directions to tighten their respective bearings, and by turning them the correct amount in the required direction, any play in the shaft is eliminated. But care must be taken not to get them too tight. The shaft should be free to turn without the slightest hint of binding.

Should it be required to bring the pinion into deeper mesh with the ring gear, both adjusting nuts must be turned simultaneously in one direction or the other. To

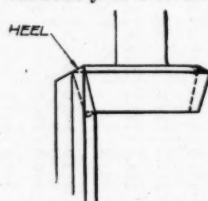


Fig. 3—Gear set too deeply into pinion

Fig. 2—Proper meshing of gear and pinion

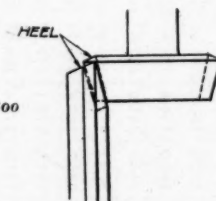
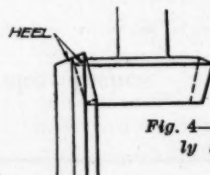


Fig. 4—Pinion too deeply set in gear



a spring ring A. This adjusting nut acts on the thrust bearing independently of the roller bearing, which is closer to the pinion.

Having made the adjustments, be sure to replace the adjustment locks and tighten the bearing cap bolts.

Questions Efficiency of Twelve Cylinders

DETROIT, Mich.—Editor Motor Age—At a recent meeting of the Detroit Section of the Society of Automobile Engineers, after reading of a paper on the twin six by J. G. Vincent, Packard vice-president of engineering, the question of how far the twin principle might go and what cars might logically use it was brought up by A. Ludlow Clayden. Consistent with recent trade paper editorials advising against the sheep principle of stampede, there would seem to be several important considerations which should militate against the adoption of twin motors in certain classes of cars.

Mr. Vincent brings out the fact that ability, or range of ability, coupled with smoothness is the sine qua non of most motorists. The first is obtained by gear ratios and by the proportion of available horsepower to weight, as most engineers will admit when they consider the get away of the four-cylinder racing car, while the second he has proved very conclusively to lie in what he terms "the six-cylinder principle." At least no refutation of his arguments and diagrams was heard from any of the advocates of the eight-cylinder or the twin four principle.

Six vs. Twelve

In connection with Mr. Vincent's admirable address there are one or two things that do not seem entirely clear, particularly in his argument for the twin motor from standpoint of efficiency. His comparisons of performance between the twin six and the Packard high-efficiency six are very interesting, but hardly fair when it is conceded that the only changes in the single six were increased compression and the substitution of light reciprocating parts, while the twin six was designed along high-speed, high-efficiency lines from the beginning. I believe Mr. Vincent subsequently said that the valves were the limiting factor in the design of the cylinder block of the twin six and admitted that nearly a quarter greater effective opening was secured for the twin six than was the case of the single six. This factor in connection with the higher compression, which enables each cylinder properly to function at high speeds should in my mind be given greater prominence in the design of the high-efficiency motor. Certainly it does not seem likely that the weight of reciprocating parts alone is the greatest determining factor in a high-speed motor. This is a fallacy that appears in nearly every catalogue: "By the use of light reciprocating parts, etc., an extremely high-speed motor is secured." If this were so, how would four-cylinder racing motors

Space limits the number of designs that can be taken up individually, but the two types here shown are representative, and most any axle can be adjusted by applying the same reasoning that is used here. However, it is a task that one should carefully study before putting into practice.

in the 300 cubic inch class be able to show such high motor speed, for in many cases their reciprocating parts weigh nearly 75 per cent to 100 per cent more than the weights given for these parts in the Packard twin six motor, while the maximum speed of said four-cylinder racing motors is considerably above anything claimed for the twin six?

The greater efficiency shown by the twin six motor, and the economies claimed for it therefore hardly can be a result of the twin principle, or the increase in the number of cylinders, for this is directly in

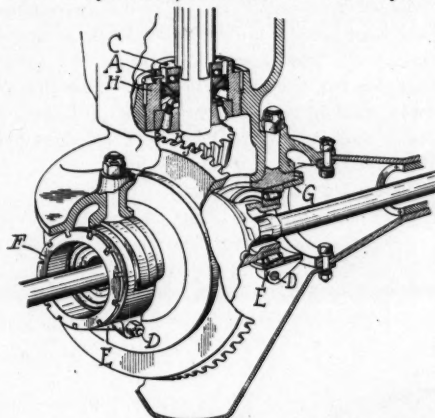


FIG. 6—STUDEBAKER REAR AXLE
Cut away perspective locating various parts to be adjusted

contradiction of some of the first laws in gas engineering laid down by Beau de Rochas. On consideration, it will be seen that the greater the number of cylinders, the greater the loss of heat units, or energy, through the flame swept area in contact with the expanding gases.

Therefore it would seem that Mr. Vincent must give credit for the greater efficiency of his new twin six motor to its admirable design and close application to high-efficiency principles throughout. And furthermore, it would appear that the same principles applied to the small-bore, high-speed, high-efficiency, six-cylinder motor for light cars will produce the acme of motor desiderata for the moderate-weight

vehicle. The light six combines the smallest number of cylinders that give a constant turning effect together with a grouping of reciprocating bodies that puts them in "absolute theoretical and practical balance." Thus it would appear that the high-efficiency six-cylinder motor is the simplest, most economical and most durable motor that may accomplish these results.

Is the twin motor necessary today in the moderate-weight, medium-priced car? It would seem not. Mr. Clayden wisely raised the point of explosion frequency or number of explosions for distance traveled as a factor in securing range of ability, although it may be that he did not exactly define it as such. This would seem to be harking back to the single-cylinder, high-speed, low-gear motor of the De Dion days, and the adoption of the principle of the high-speed motor, together with the grouping of these parts into a "V" type, must be extremely grateful to the school of the Marquis De Dion, as it is to some of those who fought his battles on this side in the early days when the original Packard slow-speed, single-cylinder motor was booming its way across the continent like a 42-centimeter Krupp gun. Since the high-speed motor and the principle of explosion frequency are indissolubly linked together the roughness of which Mr. Vincent complained in his high-compression single six may be smoothed out by proper gear ratio, when the other factors of power, car weight, etc., are considered. Thus, twin motors do not seem required so much by road conditions and range of ability as by the weight of the car and the work required of the motor.

Six in Practical Balance

To put this case in an extremely practical way, since Mr. Vincent states that "the six cylinder motor is in absolute theoretical and practical balance," and informs us that he can run half of the twin six without apparent increase in vibration over that of a single six motor of equal size, why not use half the motor or six cylinders for a car of half the weight—4,500 pounds? In others words, in a 2,000 to 2,500-pound car let the high-efficiency six-cylinder motor supply the perfect balance, and by proper reduction of gear ratio secure the range of ability required for this year—1916. d car.—Ralph Lewis, Engineer, Caille Perfection Motor Co.

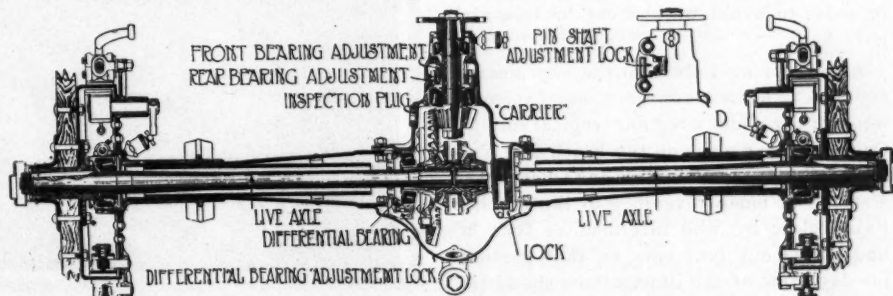


FIG. 5—SECTION OF HUDSON REAR AXLE SHOWING THE ADJUSTMENTS
View gives location of component parts making up the rear axle of the 6-40

Touring Under Difficulties ^{by} Mrs. Frank Dudley

OUR itinerary included 3,000 miles of mud touring from June 28, 1915, the Gumbo Special, a Ford car which had been driven 22,000 miles in the last year, left Yankton, S. D., at 4 a. m. for a tour to Miles City, Mont., and return.

The first day's drive proved to be the best of the 3 weeks' experiences. Having covered 175 miles, the last of which was in a cloudburst, along the brakes of the Missouri River into Chamberlin, S. D., the following day the party headed west and experienced the worst road conditions that country had ever seen.

Having reached Reliance, a distance of 14 miles, for lunch, after which we kept on in a downpour of rain, and made Murdo, S. D., the following morning. We proceeded 10 miles, when we encountered another cloudburst. We reached Belvidere, S. D., after strenuous driving, part of



Where skid chains were necessary

with a wire stretcher, for which his charge was \$1 per pull. In order to save time he kept three horses harnessed and the necessary appliances hidden in the grass nearby for the use of teams. His charge was one dollar per horse per pull and it took one pull with three horses to get the Gumbo Special out of this hole.

Steady Downpour of Rain

The trip for the rest of this day was uneventful except for the steady downpour

of rain which seemed to follow the Gumbo Special. Having reached Kadoka, S. D., the east entrance of the Bad Lands, we were informed that it was impossible to drive through there and changed our routing by the way of Cottonwood. Leaving Cottonwood in a downpour of rain we struck terrific roads and were pulled out several times with teams and were making fairly good time, considering everything, when our magneto became damaged and we were left high and dry 5 miles from the railroad. Obtaining a team we were towed into Quinn, where we tried to get transportation for the car to Rapid City, but the railway had no facilities for loading the car and we were compelled to dismantle the magneto and take the next train to Rapid City, having the magneto repaired.

It was raining yet when we left Rapid City the next day. We reached Belle Fourche the same evening. Leaving there the following morning we found excellent roads for about 30 miles toward Camp Crook and then the roads were simply indescribable.

We reached Camp Crook the same day and from there to Baker, Mont., and on to Miles City the Yellow Stone Trail is excellent and a credit to that western country in that it is kept in a good condition all the time.

From Miles City to Bowman, N. D., and from Bowman to Buffalo, S. D., road conditions were good with the exception that there were no bridges and the streams



A shovel was as necessary as gasoline

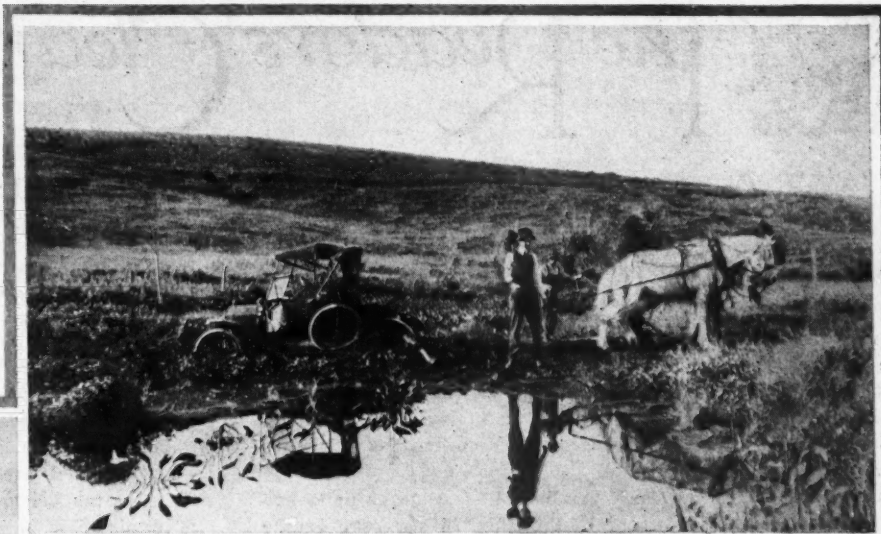
which was detouring the regular highway in order to avoid washed out bridges and mire holes.

After leaving Belvidere the sky cleared for a few hours and the roads improved wonderfully under a regular tropical sun. On one particular place on the Black and Yellow Trail between Belvidere and Okaton was a source of much reverence to the rancher living close by who informed us that he had pulled out four cars on that particular day. One of the illustrations shows the stakes driven in the ground, which he used

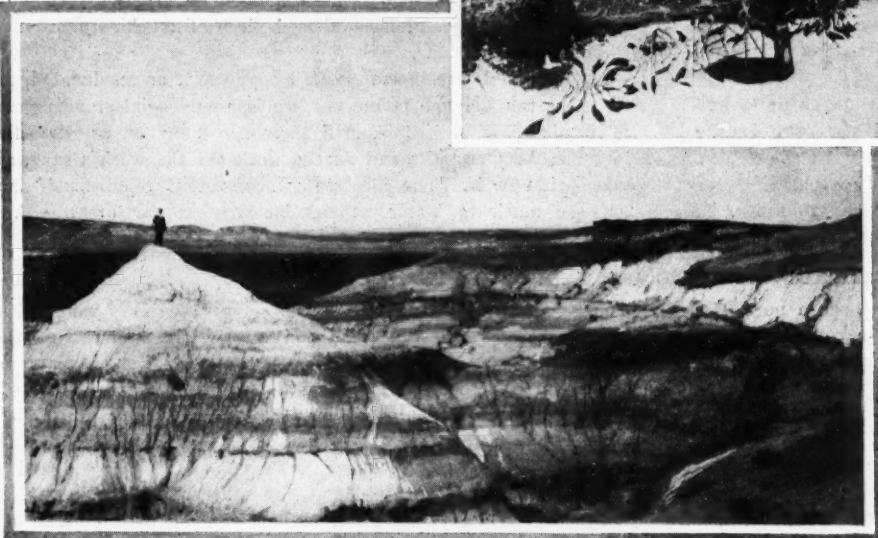


Doing scout duty on the Black and Yellow trail

were bank full, one very bad crossing being that of Jones Creek where we were delayed 3 hours. We left Buffalo, S. D., by Indian pass for Strool and were compelled to ford the Grand river in which we struck high water owing to a quicksand pocket wherein the Gumbo Special rested 5 long hours with the water running through her insides. After being pulled out we proceeded on to Strool through some of the most beautiful scenery in the United States. Leaving Strool the following morning we proceeded on our way to Faith, S. D., facing a storm most of the



Dobbin and his pal come to the rescue



A glimpse of the bad lands of the Dakotas

way which eventually overtook us and filled every gully to its capacity, causing us to stay in one of these gullies, owing to the fact that the water had reached our magneto. From Faith we proceeded over 110 miles of the worst road that a motor car ever encountered.

No Mail for 7 Days

Along this road there had been no mail for 7 days and we were told as we proceeded from one ranch to another that it was out of the question to go any farther, that there were no bridges left, and that fording the creeks would be impossible.

We kept going and when we would reach one of these bridges we would build tracks of timbers, then drive onto the bridge and carry the timbers to the other side and build a track to run off on.

Where we found this impracticable we would reconnoiter wherever we would come to a narrow place in the stream and carry the timbers and span this creek. This we did 5 times. We left Vale, S. D., in more rain, then crossed the alkali flats to Sturgis, S. D. Thence to Rapid City, where we were

laid up for repairs and a well earned rest, having driven 21 days and averaging better than 100 miles a day and having been rained on from one to three times a day the entire trip. After leaving Rapid City for Yankton, S. D., the trip was uneventful, except the road conditions were not materially improved and the bridges had not been replaced along the Black and Yellow Trail.

Answers to Route Inquiries

Little Rock, Ark.-New Orleans, La.

Monticello, Ark.—Editor Motor Age—Kindly give the best route from Little Rock, Ark., to New Orleans, La.—F. B. Mariette.

From Little Rock route east to Helena, through Galloway, Lonoke, Prairie Center, Hazen and Clarendon. From Helena drive through Tunica and Lake Cormorant to Memphis. Here turn south, passing through

Lynchburg, Miss.; Lake Cormorant, Clacks, Robinsorville, Hollywood, Tunica, Clayton, Dundee, Coahoma, Tutwiler, to Sumner, Miss., 120 miles. Continue south 463.5 miles via Schlater, Greenwood, Lexington, Franklin, Goodman, Pickens, Canton, Jackson, Terry, Crystal Springs, Hazlehurst, Beauregard, Brookhaven, Osyka, Miss.; Kentwood, La.; Greensburg, Baton Rouge, Darrow and Kenner, to New Orleans, La. It is suggested that you make local inquiry as to the condition of the roads between Memphis and New Orleans, as due to recent storms the roads are said to be in a very poor condition.

Points Out Better Road

Fort Worth, Tex.—Editor Motor Age—I am a frequent reader of Motor Age and always am interested in the route information given, but there is one item in your issue of September 30, in which you give what I think to be the longer route. I refer to your answer to J. E. Seeman, Copeland, Kan.

I was over the route from Fort Worth to Hutchison, Kan., then west to Dodge City, and back to Fort Worth, via Amarillo and Wichita Falls, Tex., last August, and as my going route was the same as you give through Arkansas City and Oklahoma City, I am pretty well acquainted with the roads by that route and I must say that if I were going to make the trip from Dodge City to Dallas, knowing the roads as I do, I would much prefer the route from Dodge City south through Liberal, Guymon, Stratford, Dumas, Amarillo, Wichita Falls and Fort Worth to Dallas.

The roads in central and southern Oklahoma have never been worked, while the roads via Amarillo are practically all well graded and there is practically no sand or hills, both of which will be encountered in central Oklahoma.

As to the last part of the route, in southern Mississippi, the writer lived in one of the towns you mention for 13 years and is pretty well acquainted with roads in that territory also. From Jackson, Miss., it is much easier to go directly to Gulfport by following the Gulf & Ship Island Railway than it is to go even one-half of the route you recommend from Jackson to Gulfport via New Orleans. There are good roads all the way through from town to town on the railroad mentioned and the road practically follows a ridge all the way through.

On our trip this summer we found the published logs incorrect much of the way.



The gumbo of the Dakotas is no respecter of vehicles



The Readers' Clearing House



"Incompetent Car Owners"

GARAGEMEN SPEAKS FOR FELLOWS

OKMULGEE, OKLA.—Editor Motor Age—I have noticed that in several recent issues you have occasion to comment on the incompetent repairman, and as no brother of the wrench and spanner has taken issue with you, I am going to take it upon myself to say a word in behalf of the trade. While it is true that there are many incompetent mechanics, they are largely the product of the "Become an auto expert in 30 days" trade schools, and the average car owner is largely responsible for this class of men.

And, by the way, why don't you devote a paragraph or two to the "Incompetent car owner?" Probably 75 per cent of the wails that arise, emanate from some car owner who has just bought a "Henry car," and, after burning out his bearings or some other trouble arising through his own crass ignorance, he tears his hair and has a fit if his repair bill amounts to more

than 30 cents. As a trade, that of a motor car mechanic is the most poorly paid of any trade I know, considering the skill and knowledge required, and the average car owner who doesn't say a word at paying a man 75c per hour for laying a few bricks on top of each other, will kick like a bay mule at paying the same money to a man who has at his command an expert knowledge of the most intricate and most abused piece of machinery on earth, the modern motor car.

Not all of us are incompetent, or ignorant, or uneducated, and while, as the Tribune points out, we lose our social standing with a certain class of people, still there are many of us who climb into our dirty overalls and do the work for the work's sake, and take pride in it. The average "incompetent repairman" isn't half so much to blame as the incompetent car owner.—C. C. Jenkins.

REPAIRMEN NOT THE ONLY OFFENDERS

Union City, Pa.—Editor Motor Age—Having been a purchaser of your magazine for 4 years, would like to say a few words in answer to the Chicago Tribune's and your own articles about repairmen.

Motor Age spoke of our being unfit and incompetent and only poor handy men. Did either Motor Age or the Chicago Tribune ever try to please anybody? It can't be done. Furthermore, did you ever stop and think, hundreds of different makes of cars, models change every year, and a lot of them twice a year, and a car usually lasts about 5 years. Oh, no, a repair man doesn't

have to know any more than you or any ordinary man. Poor drivers, lack of common sense and oil cans spoil more cars than are built and while we are speaking of spoiled cars, don't forget the neighborhood handy man and the garage man who expects to get a good repair man for \$18 or \$20 a week. You can't do it. Your ringing in the social position bunk on us does not go. It's honest, hard, dirty work and it takes a man to hold a job down and you can't dance all night if you expect to do so, but all the man in the pit asks is not to be classed with out of line handy men and book mechanics—A. L. Bennett.

SUBSTITUTES FOR GASOLINE Benzol and Alcohol Production Compared with Fuel Used Today

PITTSBURGH, Pa.—Editor Motor Age—I notice in your issue of October 14, page 28, you refer to an address given by me before the Franklin Institute of Philadelphia on October 7, quoting me to the effect I predicted lower prices for gasoline. This is not correct. What I had to say on the subject will be published in full in an early issue of the Journal of the Franklin Institute, but I would like to point out that, by a brief consideration of the possible gasoline substitutes, I was able to show that cracking methods for the production of gasoline would necessarily become of continually increasing importance. This does not necessarily mean a decrease in the price of gasoline.

The most talked of gasoline substitutes are benzol and alcohol. In regard to the former, I would like to call your attention to a recent address by I. F. Stone, president of the National Aniline and Chemical Co., delivered before the New York Section of the American Chemical Society at the Chemists' Club, October 9. Mr. Stone estimated the present production of benzol as approximately 15,000,000 gallons. According to the October issue of Metallurgical and Chemical Engineering, the amount of coal now being coked in by-product ovens is approximately 15,000,-

000 tons. It would be safe to figure that, on an average, 2 gallons of crude benzol are obtainable from each ton of ordinary bituminous coal, coked in by-product ovens. This would bring the possible production of benzol from this source up to 30,000,000 gallons. If all of the coke required for our blast furnaces in America were produced in by-product coke ovens and all of the benzol recovered, we would have about 80,000,000 gallons annually.

In order to see how relatively insignificant even this quantity of benzol is in comparison with the annual requirement of the motor car trade, it is only necessary to point out that this 80,000,000 gallons of benzol is equivalent to something less than 2,000,000 barrels of gaso-

line—42 gallons per barrel—and that the production of natural or primary gasoline in this country was estimated several years ago, by the U. S. Geological Survey, to be about 25,000,000 barrels. Not counting the recently installed cracking methods, the production of gasoline in this country at the present time is certainly not far from 30,000,000 barrels. In other words, the largest possible production of benzol, which we could expect to be attained in this country in the next 8 or 10 years, would still be less than 7 per cent of the gasoline production. Undoubtedly, the benzol which does not find use in the chemical industries could be disposed of as motor fuel.

Furthermore, it might be pointed out that the price of alcohol, for industrial purposes in this country, is normally 30 to 35 cents per gallon, and while it is usually somewhat cheaper than that in Europe, nevertheless, no alcohol was used in England a few years ago, when gasoline retailed for a considerable period of time at about 42 cents per gallon. This is readily understood from a consideration of the relative power value of alcohol and gasoline.—Benjamin T. Brooks.

Some Motor Racing Records

Herrin, Ill.—Editor Motor Age—What is the speed record for ½-mile dirt tracks, and who made it?
2—Has the Fiat done any racing during 1915? If not, why?
3—Has Duray's speed of 142.8 m. p. h. in

Questions Answered and Communications Received

C. C. Jenkins.....Okmulgee, Okla.
A. L. Bennett.....Union City, Pa.
Benjamin T. Brooks.....Pittsburgh, Pa.
Joe M. Anderson.....Herrin, Ill.
A. Subscriber.....Brooklyn, Wis.
A. C. LaRose.....Pony, Mont.
Fred M. White.....Wellington, Kan.
H. N. Hansen.....Kansas City, Kan.
D. D. D.....Rochelle, Ill.
W. J. Mull.....Mulberry Grove, Ill.
A. L. Bennett.....Charlotte, Mich.
E. E. Bidwell.....Rockdale, Tex.
C. W. Lundy.....Malad City, Ida.
Horn Bros.....Sedgwick, Kan.
Subscriber.....Keene, N. H.
S. A. C.....Mt. Vernon, Ia.
Geo. W. Curtis.....Des Moines, Ia.

No communications not signed with the reader's full name and address will be answered.

the Fiat ever been outdone by motorcycle or airship?

4—Where is the Fiat manufactured?
5—What is the best record made by the Cornelian light car racer?—Joe M. Anderson.

1—The American Automobile Association does not sanction $\frac{1}{2}$ -mile dirt track events, and therefore has no speed record covering this class of racing.

2—No. The piston displacement of the Fiat is too large, the present limit being 450 and 300 cubic inches.

3—No.

4—At Poughkeepsie, N. Y., and Turin, Italy.

5—It qualified over the 85-mile mark at Indianapolis.

WANTS AXLE DISMANTLING DATA

Method of Taking Down Semi-, Three-quarter and Full Floating Types

Brooklyn, Wis.—Editor Motor Age—Will Motor Age kindly give me full directions in taking down the three-fourths, full and semi-floating axles, also transmission when assembled with axle? I especially would like directions in regard to Buick, Overland, Hupp, all late models. —A Subscriber.

In general, the extent of the dismantling of the axle depends upon the work to be done. If it is desired to take the axle from under the car, it is not advisable to remove the wheels at first, but if the work is simply connected with the differential, which must be removed, it is simply a matter of taking off the wheels, pulling out the axle shafts clear of the differential, and then taking off the bearing caps which hold the bearings in the carriers, after which the differential in most cases will slip out immediately. Then it is merely a matter of common sense to dismantle the differential unit.

One bit of advice that is most important is to tag all parts that you take out so as to make sure of putting the right piece back in its correct place. Or, if you do not mark them, be sure you can put them back where they belong.

If it is required to take the whole rear unit from under the chassis, the first step is to jack up the frame independently of the axle and rear wheels. Then disconnect the springs from their seats on the axle tubes. In the Buick and Overland late models a torsion tube surrounds the drive shaft and it connects to a cross member of the frame at its front end. After having disconnected springs from axle, and also disconnected the brake control rods and the gearshift control rods (if it is the Overland), the front end of the torsion tube yoke should be released from its frame connections. Then the rear unit should slip away. The squared front end of the drive shaft slides in the universal joint in some installations, among them the Buick, and this must simply be slipped out of its squared hole. Sometimes the squared shaft end is ahead of the uni-

versal, but the dismantling is the same. In that case, the universal comes off with the rear unit.

Once the axle unit is out of the car, the tube can be taken off the drive shaft by unbolting it from the axle housing at the flange. In the case where the gearset is in unit with the axle, you will find that the torsion tube bolts to a flange at the front end of the gearcase, and the gearcase, in turn, bolts through flange construction to the forward side of the axle housing. These parts come apart readily when once you get at them.

Where the drive shaft is open, as in the Hupmobile, you must first disconnect the drive shaft from the pinion shaft of the axle at the rear universal joint. Then, after disconnecting brake rods, and releasing the springs from the axle, it should come loose from the chassis without much difficulty.

There are no hard and fast rules that can be given to apply to all axles, but common sense and ability to do repair work are your best friends. After you get at any particular dismantling job of

clear of the differential before the latter can be taken out.

In disassembling the Overland gearset, the main transmission shaft goes out first, then the counter shaft and finally the reverse gears.

HARD STARTING OF BUICK 10

Cylinders Should Have Been Rebores When Car Was Overhauled—Priming Plugs

Pony, Mont.—Editor Motor Age—I have a model 10 Buick which I had thoroughly overhauled by an expert some time ago, but it is very hard to start and it hasn't much power. The water pump does not seem to work right because the radiator and the engine get hot after running 6 or 7 miles. I have an Air-Friction carbureter. This was on the car when it came from the factory. There is some oil that comes through the valves, and the engine is very hard to start the first time when the engine is cold, but after it is warmed up it is very easy. Would Motor Age advise me to get a set of spark plugs equipped with priming cups? If not, what shall I get?

2—What actual power has a model 10 Buick? I know they are rated at 28 horsepower, but I am in doubt about it.—A. C. LaRose.

1.—Priming plugs might help in getting started. It is likely that the cylinders are somewhat out of round and should have been re-bored. This is borne out by the fact that oil gets past the pistons, and

if the pistons and rings have been overhauled properly, it would seem that the trouble is in the cylinders themselves. Leakage past the pistons would account for the lack of power also. The water pump

might be out of order, but that is a thing which is easy to determine. See that the water piping is not clogged and that the rubber hose connections are in good shape. The lack of power might also be due to improper adjustment or action of the carbureter.

Buick 10 Valve Timing

Wellington, Kan.—Editor Motor Age.—Kindly give me the valve timing on the model 10 Buick. —Fred M. White.

The exhaust opens $\frac{1}{8}$ inch past lower dead center. The exhaust closes $\frac{1}{8}$ inch past top center. The inlet opens $\frac{3}{8}$ inch past top center. This is all the timing data used in timing the valves of this engine.

REDESIGNS A 1910 CHALMERS

At a Cost of \$70 Reconstructed Job Takes Appearance of Late Model

Kansas City, Kan.—Editor Motor Age—I have noticed from time to time illustrations of rebuilt cars in Motor Age. These always have been of interest to me, and thinking that others may be interested I am sending you pictures of the job I just completed on a 1910 Chalmers, model K, 30. This car originally was a three-passenger, as will be seen by the other pic-

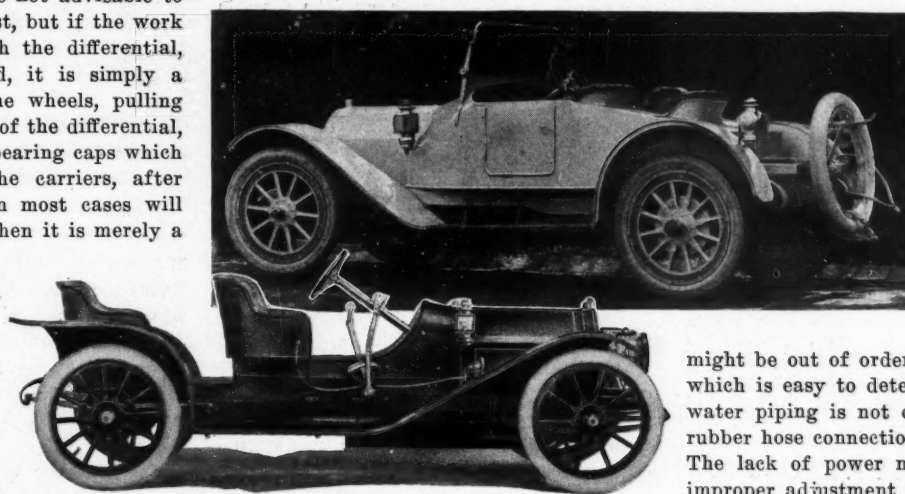


Fig. 1—Reconstructed Chalmers of 1910 and its original appearance

this kind, you can readily see how the parts are fastened together. In fact, it is child's work to pull down a piece of machinery, but the re-assembling is another matter.

Where an axle is floating, you can usually pull out the axle shafts without disturbing the wheels, but in cases where the semi-floating construction is employed, the shafts are connected to the wheels direct, and this requires taking off the wheels first, when the shafts can be pulled out. In the late Overland models, for instance, to take out the axle shafts, you first loosen the screws of the differential adjusting collar until the threaded portion of the shaft may be withdrawn through the collar. The inner ends of many axle shafts are squared and fit into squared holes in the differential, hence it is only necessary to slip them out after the outer ends are freed. In any case, it is necessary to bring the axle shafts out

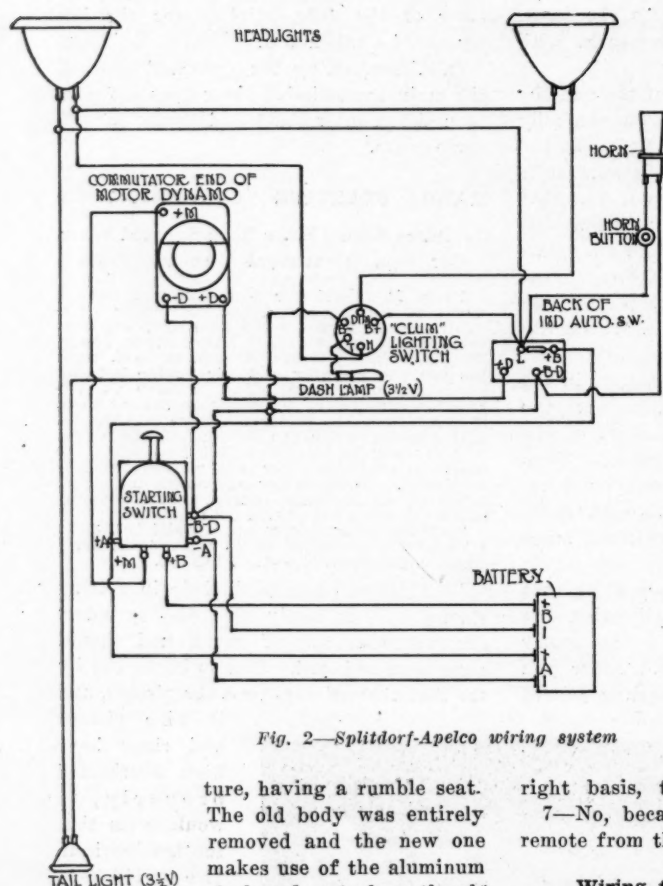


Fig. 2—Splitdorf-Apelco wiring system

ture, having a rumble seat. The old body was entirely removed and the new one makes use of the aluminum dash and seats from the old body.

The gasoline tank is hung in the rear, the frame of the car having been extended by the use of part of another car frame, bolted on top of the side members of the chassis. The cost was about \$70, which covered lumber, sheet metal work and blacksmithing. The time required was not kept, as the work was done during odd moments.—H. N. Hansen.

WHY IS N. A. C. C. H. P. RATING LOW Reason for Apparent Discrepancy Between Horsepower by Formula and Test

Mulberry Grove, Ill.—Editor Motor Age—What are the weights of the five and seven-passenger Hupmobile touring models?

2—Which does Motor Age consider the better clutch, a multiple-dry-disk or multiple-disk operating in oil?

3—Is a ball-bearing axle considered as good as the roller-bearing type?

4—Is thermo-siphon cooling as efficient as the circulating pump?

5—What is meant by the pitch of a gear?

6—Why is the N. A. C. C. rating of motors nearly always lower than the brake horsepower?

7—Is there not more danger of fire from placing the gasoline tank in the cowl than if located a greater distance from the engine?—W. J. Mull.

1—The Hupmobile company gives the weight of the model N five-passenger model at 2,870 pounds. The seven-passenger car weighs 3,250 pounds, they state. These weights are without water or gasoline.

2—It would be impossible for Motor Age to answer that question. Both types are efficient, and each has proven successful, if properly designed.

3—Yes.

4—Yes, if properly designed, though there are limitations to the size of the en-

gine to which it is adaptable.

5—The pitch of a gear is the distance measured on an arc of the pitch circle from the face of one tooth to the face of the next. Referring to Fig. 4, C is the pitch circle, and the pitch is therefore the distance P. It will be noted that the pitch includes the thickness between it and the next tooth.

6—The N. A. C. C. rating is based upon a piston speed of 1,000 feet per minute as being that at which an engine should deliver its rated power. But most engines now built run at higher speeds and do not give their maximum power at so low a speed. This will account for the apparent discrepancy. The formula is all right if put on the

right basis, that is, piston speed.
7—No, because the tank is sufficiently remote from the ignition.

Wiring for Double-Bulb Lights

Rochelle, Ill.—Editor Motor Age—Kindly give a wiring diagram of the Splitdorf-Apelco starter for Fords, using two-bulb dimmer reflectors instead of dimmer switch furnished by manufacturers.

2—Kindly show wiring of horn and dash lights.—D. D. D.

Wiring of the Splitdorf-Apelco starting and lighting system is shown in Fig. 2. The headlights are connected, so as to require only one set of bulbs, the dimming being accomplished by throwing them in series. In the regular application of this system, a dimming switch is used, this throwing in resistance. You will find the use of the series-multiple arrangement is simpler and better than going to the trouble of wiring for two sets of headlight bulbs. The diagram also shows the connections of a horn and dash light. The headlight bulbs should be 7 volts, the dash and tail lights to be of the same voltage and candlepower, namely, 3 1/2 volts.

Charging Ford Magnets

Charlotte, Mich.—Editor Motor Age—I have a Fort Wayne motor generator which I can regulate to give 1 or 30 amperes charge, direct current. Could this be used to charge Ford magnets? If so, how may this be done?—A. L. Bennett.

Although charging of magnets is not recommended, as when the magnets get weak it is far more satisfactory to replace them with new ones of proper strength, it can be done with a current of 30 volts and 30 amperes, direct current.

Refer to Fig. 3, and also to the reply to the inquiry of Horn Bros., Sedgwick, Kansas, for explanation of the method of doing the work. That also appears in this issue.

DON'T TRY TO MAKE SEPARATORS Wood Parts of Batteries Require Special Treatment—Cost 3 Cents Each

Rockdale, Tex.—Editor Motor Age—Has the Cadillac company ever made Knox cars, or parts for same, or connected in any way with them? Did they ever make hub caps with the two names to fit the Knox cars?
2—Is it possible to cut wood separators in sheets or already cut to fit each size cells, also the prices on same, or does each manufacturer have a different price? Give the names of two reliable concerns from whom we might obtain these.—E. E. Bidwell.

1—The Cadillac company never had any connection with the Knox company.

2—No. The wood separators that are used in storage batteries are specially prepared, the process usually taking about 10 days. They are treated with a preparation which renders them immune to the attack of the sulphuric acid, and then, too, they must be made of a certain kind of wood which does not have harmful properties. They are grooved in a special way, this the result of the battery makers' experience. The Willard Storage Battery Co. charges 3 cents each for wood separators. The Willard company is located in Cleveland. Other battery makers who could supply you are: Electric Storage Battery Co., Philadelphia; Gould Storage Battery Co., New York; U. S. Light and Heating Co., Niagara Falls, N. Y.; Vesta Accumulator Co., Chicago.

SUGGESTIONS FOR POWER INCREASE

Reader Offers Additional Information to Subscriber with Weak Engine

Malad City, Ida.—Editor Motor Age—In the September 30 issue of Motor Age, page 36; Readers' Clearing House department, Subscriber of Akron, O., did not state whether or not his motor missed fire, but only mentioned that it lost power. The answer given by Motor Age is O. K., but I would like to make some additional suggestions which I believe will cure the trouble.

Take off the cylinder head and look at the valves. Throw away the valve springs; new ones are cheaper and have more spring. Examine the valve faces. The valve faces will be found to be concave in the intakes, and possibly on the exhausts. Replace those having worn stems with new ones. Face the valves with a lathe file, not a cutting tool, using a very fine cut, to take out the concave, which will make the valve the same as new. Now use No. 0 emery cloth to smooth the face. Grind the valves in the same seat as they

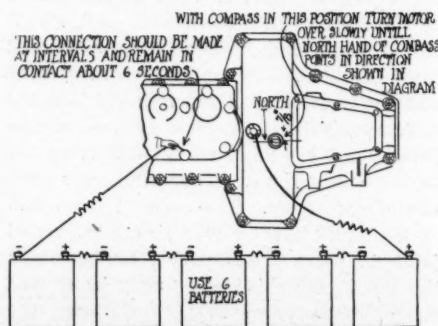


Fig. 3—Recharging Ford magnets

were originally, grinding only until there is a streak about $\frac{1}{16}$ -inch all the way around across the valve face. Now stop grinding, otherwise you will injure it. It will require about twelve turns to grind each valve.

At this point you have reached the particular part. Examine each seat in the cylinder casting to see that the valves seat all the way around. Put each valve in its proper place, taking care to see that there is not a piece of carbon between the valve stem and the pushrod. Turn the motor over until the piston is at the top center, ready to rock and start down. The exhaust valve should close as the piston rocks over center. Turn a little more until the top of the ring in the piston is even with the cylinder—the piston travels about $\frac{3}{4}$ -inch—and the intake should just start to open. Should the valves open too quickly, file off the bottom of the stem until it is correct.—C. W. Lundy.

RECHARGING FORD MAGNET COILS How to Instill New Life Into Ignition System Without Removing it from Car

Sedgwick, Kans.—Editor Motor Age—I would like to install a charging system for charging Ford magnetos without taking them from car. Kindly give a diagram of this, and also what position the magneto should be in when the magnets are taking a charge.

2—What voltage and amperage current should be used.—Horn Bros.

It is entirely possible to recharge Ford magnets without removing them from the car, although the Ford company states that from its experience, recharging of this kind is not satisfactory when attempted by ordinary garage or repair men. The Ford concern does not recommend it, and believes that in the case of weak magnets far better results follow when those parts are replaced with new magnets of proper strength.

However, for the benefit of those who wish to attempt the work, Motor Age is able to give the instructions. Fig. 3 shows the method and connections, using five or six, 6-volt, 40-ampere storage batteries connected in series. If direct current from another source is used, enough resistance should be connected in to reduce the current at the magneto to approximately 30 volts, 30 amperes.

The first step necessary is to get the magneto in proper position to receive the current. To do this, hold a compass over the transmission cover, as shown in the diagram, and turn the motor over slowly until the hand of the compass, which normally points North, will point to a spot

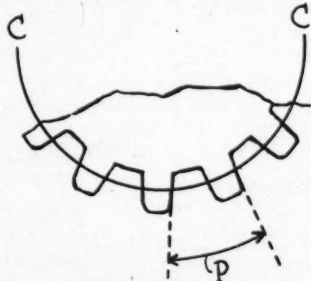


Fig. 4—The pitch of a gear

about $\frac{1}{4}$ inch from the side of the fibre at the bottom of the contact assembly on the transmission cover. Next, disconnect the wire leading to the dash coil from the contact assembly and attach instead the wire leading from the positive pole of the battery (or other source of current). You are now in a position to use the current.

To do this, make and break the current by striking the wire leading from the negative pole of the battery against some metal part of the motor. About twenty contacts, each of about 6 seconds' duration, should be sufficient to fully recharge the magnets. When doing the work be sure that you do not connect the negative pole of the battery with the contact, and also make sure that the compass indicates that the magnets are in the position described above. Otherwise, they will be weakened instead of remagnetized.

SOME FEATURES OF THE DODGE CAR

New Gearset Gate Reverses Method of Shifting Lever in Changing Speeds

Keene, N. H.—Editor Motor Age—I understand that the position of the gears in the transmission of the Dodge car have been changed from the position they occupied in the earlier models. What is the present arrangement?

2—Did the motors in the earlier models have cages that screwed on over the valves as well as removable cylinder heads?

3—The warm air entering the carburetor instead of being taken from a stove surrounding the exhaust manifold, as formerly, now is taken from the case surrounding the valve stems and lifts and the case is supplied with warm air by means of holes in the cover plates. Will this draw sufficient dust and grit into the case to cause the valve stems and lifts to wear unduly, or have the manufacturers made some provision for protecting the wearing parts?—Subscriber.

1—The gears have been shifted from right to left. This simply reverses the method of shifting from one speed to another. Referring to Fig. 5, you will understand the present positions of the speed lever.

2—They have removable cylinder heads, but the spark plugs and priming cocks are all that are over them.

3—How could it draw dust and grit into the valve compartments? The tubing running from valve compartment to car-

Unsigned Queries

Motor Age has received communications addressed to the Readers' Clearing House from the following named towns and noms de plume:

| | |
|-------------------|-----------------|
| Petersburg, Ill. | J. C. McCheston |
| Portland, Ore. | A Reader |
| Yonkers, N. Y. | A Subscriber |
| Tripoli, Ia. | A Reader |
| New York City | H. C. F. |
| Beloit, Wis. | Subscriber |
| Pikeville, Tenn. | A Reader |
| East St. Louis | |
| Rock Island, Ill. | H. N. B. |
| El Dara, Ill. | |
| Augusta, Ga. | J. E. S. |

These communications will be held until the proper signatures have been received. All communications, written over a nom de plume, must bear the writer's signature, otherwise such communication will not be answered. These signatures are wanted as proof of the authenticity of the inquiries.—Editor Motor Age.

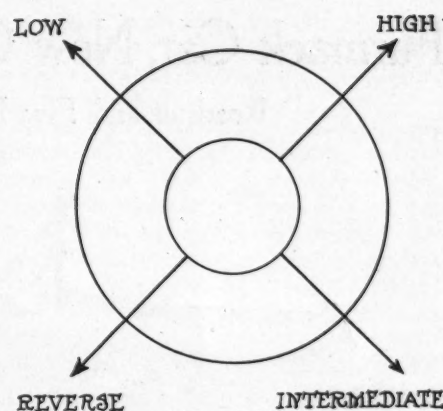


Fig. 5—Later Dodge shift design

bureter does not communicate with the outside at all, and the manufacturer would not have made this arrangement if it were not satisfactory.

LOUD KNOCK IN E. M. F. OF 1910

Recurrent Pounding Probably Due to Worn Bearings

Bridgeton, Ind.—Editor Motor Age—I have a 1910 model E-M-F 30 which has had a knock in the front end of the motor about a year. When motor is in high gear on the roads, the knock resembles hitting the pan with a large wooden mallet making a heavy thud, loud and regular with the exhaust of the motor. I have had a new front bushing put in the front bearing and have had the crankshaft put in a lathe and smoothed up the front end and had a bushing made to fit it, also all main bearings adjusted tightly. When the crankshaft was put in the lathe, we found it perfectly true and after putting both new bushings in the front bearing it stopped this knocking for only about 2 or 3 weeks, when it was as bad as ever. Some say it is not this bearing. If the pumpshaft and pumpshaft bushings in the front gearcase were worn, would this cause this heavy thud or knock? When the motor runs idle, we can hear a knock in the front end of the motor, but not with as heavy a thud as it is when on the road. The knock does not seem to affect the power of the car and compression is extra good. I would appreciate information concerning this matter.—Charles F. Smith.

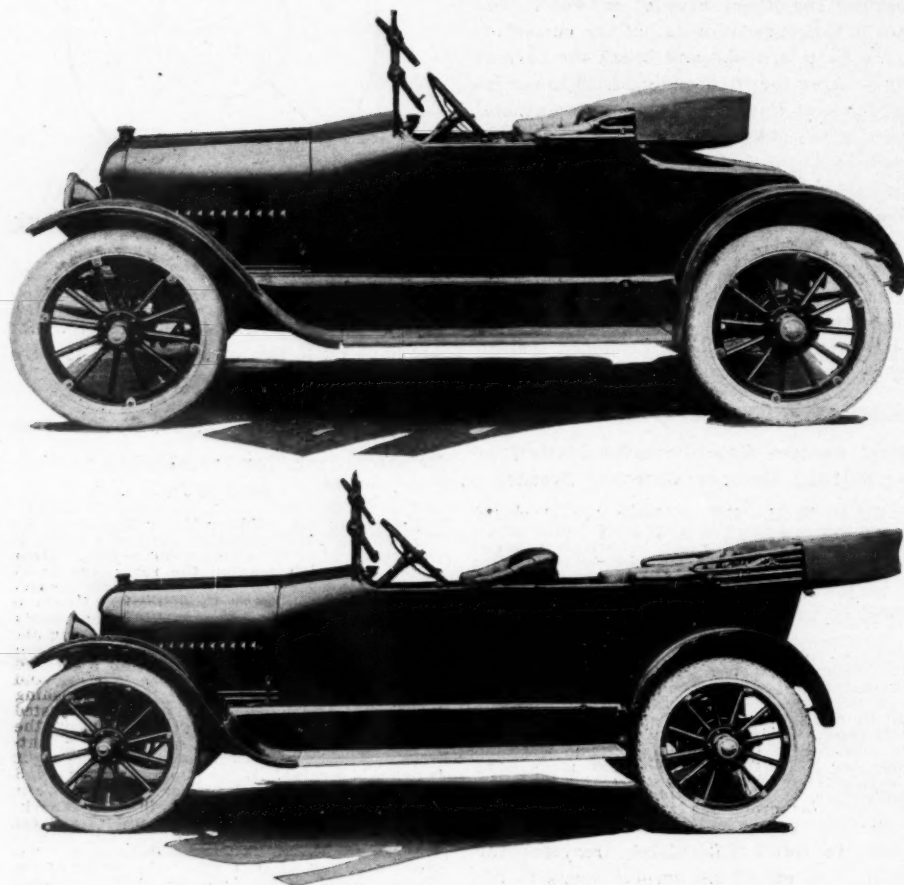
The fact that you hear the knock less distinctly when the motor is idling leads to the conclusion that it is probably a bearing knock, as that naturally would become most pronounced under load. It may be that you adjusted the main bearings too tightly when you had the bushings renewed, and this has unduly worn them out, causing a return of the conditions that existed before you put in new bushings. They must be fitted snugly, but not so tightly as to bind or cause undue frictional wear.

It might be that you have a loose connecting rod bearing, or even a worn wrist-pin bearing. Either of these might cause the kind of knock you mention. Did you have the connecting-rod bearings overhauled at the time the main bearings were adjusted? The fact that it ceased after the bearings were taken up and rebushed before, leads to the diagnosis that it was bearing trouble.

It is not likely that the pump would cause any such knock, especially as the noise is intensified under load. Further, the knock might not come from the front of the engine at all. Possibly the flywheel is loose on the shaft, but this is more remote than the bearings as a cause.

Farmack Car, New Chicago Product, Has Overhead Camshaft

Roadster and Five-Passenger Touring Sell at \$855, While Cabriolet Lists at \$1,155—Motor $3\frac{1}{2}$ x 5 Inches



TWO-BODY TYPES OF THE 1916 FARMACK

The one above is the roadster, while below is the five-passenger touring model

LATEST among the new cars to make their appearance on the market for 1916 is the Farmack, a product of the Farmack Motor Car Corp., Chicago. This is a new concern headed by A. J. Farmer, formerly of Detroit, who is president and general manager. The car is being built in the old Staver factory in Chicago and appears in three body styles on a single chassis, a roadster and a five-passenger touring car at \$855 and a cabriolet at \$1,155. The car has a four-cylinder block $3\frac{1}{2}$ by 5-inch motor, wheelbase of 112 inches, and 33 by 4-inch tires.

Has Overhead Valves and Camshaft

The feature of the Farmack car is the overhead-valve, overhead-camshaft motor. As will be seen from the views of the motor, the valves are directly in the head of the cylinder and are operated by a camshaft above them, and whose cams push directly on the valve stems or extensions of the valve stems. The camshaft is operated by a chain drive which is a two-stage drive, the first stage being a triangular chain around sprockets on the crankshaft, magneto and an idler. A secondary chain from the idler to the camshaft sprocket carries the drive to the latter.

Accurate adjustment of the timing of the camshaft drive is provided by an arrangement at the sprocket end of the camshaft by which the camshaft is driven from its sprocket through a tooth clutch

which permits the adjustment to be varied to as close limits as one-tenth of the width of a gear tooth, instead of the smallest adjustment being the width of a gear tooth, as would be the case without this subdivision. The valve stems are provided with an adjustment for wear and the contact points of the cams are of the mushroom type, both of which features are designed with the idea of eliminating noise. The valves are tungsten steel $1\frac{1}{8}$ -inch in diameter and a lift of $\frac{1}{4}$ inch.

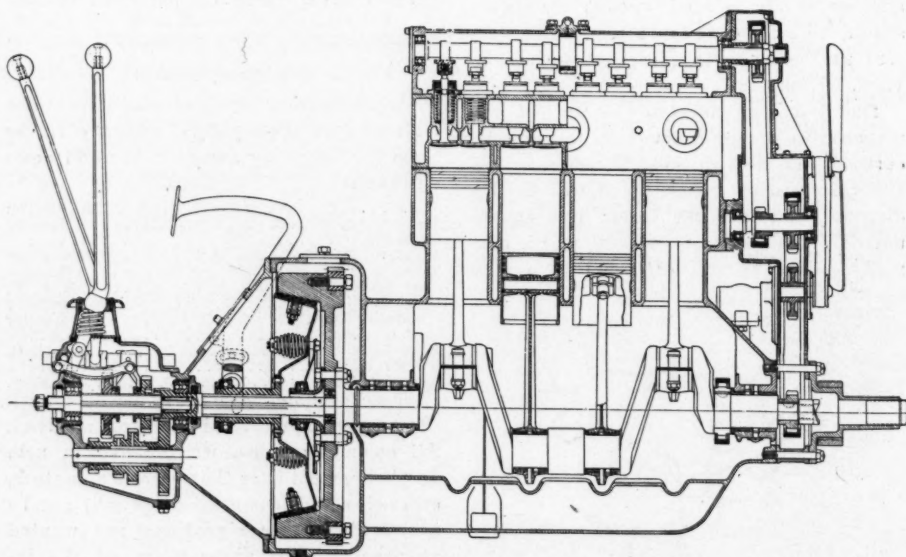
Four Parts to Motor

The motor can be divided into four parts: First, the crankcase which is split horizontally; second, the cylinder block; above this, the cylinder head carrying the valves, and above this the camshaft with its cover. The crankshaft has two bearings, 2 by $2\frac{3}{4}$ inch in front and 2 by $3\frac{1}{2}$ inch at the rear, bronze backed and babbit lined. Pistons are of the three-ring type and have oiled relief grooves directly under the lower ring to eliminate possibility of oil working into the combustion chamber.

The lubrication system is a splash system with the level maintained by a plunger pump. This pump supplies oil directly to the camshaft chamber and to the camshaft bearings, the entire chamber being flooded with oil. An overflow from the top of the motor carries oil down to the splash troughs.

Cooling is by thermo-syphon, and the electric system is the Bijur two-unit with Willard battery and Splittorf magneto. The cranking motor drives through the flywheel and the generator is driven by a separate chain from the front end of the crankshaft.

From the engine, power is transmitted



CROSS-SECTION VIEW OF THE FARMACK POWER PLANT
Showing how the overhead camshaft operates directly on the overhead valves

through a cone clutch with spring-insert face which has an arrangement for adjustment. The three-speed gearset is made by the Grant-Lee company and uses new departure bearings throughout. From this the drive is taken through an inclosed propeller shaft with a universal joint immediately back of the gearset. This is supported on the yoke, the drive being carried through three-quarter elliptic springs. The rear axle is of the floating type with roller bearings and Brown-Lipe differential. Steering is Lavine manufacture, having an 18-inch wheel.

The braking system includes internal and external brakes on 1¾ by 12-inch

brake drums. Tires are 33 by 4 inches and non-skid in the rear on demountable rims. The entire chassis assembly is supported on a heavy channel frame which is increased at the central point between the front and rear axle to 3 inches width and 3½ inches depth.

The bodies are of the smooth-cowl, streamline type with a rounded radiator and crowned fenders. Equipment includes one-man type of top, double-bulb headlights, Stewart-Warner speedometer, spare tire carrier and rim, linoleum covered running boards and electric horn. The fuel is carried in the cowl with gravity feed to the Stromberg carbureter.

has given in his book a wealth of detail that will make the reader change his perspective of those cities and localities in the old world.

Going to the Holy Land without a predetermined opinion of the country and its peoples, the author, a newspaper man, found the people who live across the Suez from Egypt to be less conscious of the Holy Land, at least as persons of this country are wont to look upon it, than we do in this country. Perhaps there is no more interesting point on the globe than the Holy Land, and for those who are not convinced of this, the depiction of Bell will prove an inspiration.

The people, the customs and beliefs, the mode of living and the idiosyncrasies of the populace that make up the Holy Land are harmoniously intermingled in this book, which leaves a lasting impression with those who read it.

The Spell of Flanders

The Page Company, Boston, Mass., announces another of the Spell Series, under the title, the Spell of Flanders, by Edward Neville Vose, price, \$2.50, net. This book is a record of a vacation tour in the beautiful old Flemish towns of northern Belgium, beginning in May, 1914, and ending just prior to the time the German, French and English field pieces began to bark and leave in their wake thousands of dead patriots and ruined buildings. This work of the author probably represents the last study made of some of the old Flemish landmarks before their destruction. The book was being written when the archduke of Austria was shot down at Sarajevo; just as the great conflict had its inception.

The Spell of Flanders offers a clear insight into that part of Belgium in which fought brave men for the preservation of the country's works of art, works of architecture and monuments to the brains of illustrious men and women, all of which today are laid waste. Those who admired the fighting spirit of the men of Flanders when they fought against such great obstacles, will enjoy the author's depiction of things for which the inhabitants of Belgium were fighting, as they were; not as they are at present.

The Motorists' Bookman

A REVISED edition of Automobile Questions and Answers, by Victor W. Page, has just come from the press of the Norman W. Henley Publishing Co., New York, price, \$1.50. The late edition includes all the latest developments in designs of the cars for 1916. Thirty-two lessons are given, covering 2,000 questions and their answers, all of which pertain to the construction, operation and repair.

The Lake of the Sky—Lake Tahoe

"Like so many other great discoveries that were to have an important effect upon the lives of countless thousands of peoples, the discovery was accidental," says George Wharton James, Pasadena, Cal., in his book—The Lake of the Sky—Lake Tahoe—published by himself, price, \$2, net. This beautiful body of water on the boundary line between California and Nevada has a magnetic charm all its own, and little journeys and camping parties on its shores are so told as to make the reader wish to include Lake Tahoe in his next transcontinental trip to California. The resorts, the history of the region and the roads and trails are explained to the reader in such a way as to bring them vividly into view, at least so far as printed words can do so.

Modern Gasoline Automobile

The Modern Gasoline Automobile, Its Construction, Operation, Maintenance and Repair, by Victor W. Page, published by the Norman W. Henley Publishing Co., New York, price, \$2.50, net, for 1916, offers a close consideration of electric motor starting systems, ball bearings and roller bearings, their maintenance and installation, and a number of other features of timely interest, such as the latest types of gasoline and kerosene carbureters, cyclecar power plants, the Fischer slide valve motor, detachable wire wheels, cantilever springs, new valve operating systems, Stewart-Warner vacuum fuel feed, boat type body design, leather universals, Entz electric transmission, positive differentials, armored cars, hydraulic brakes and the eight and twelve-cylinder motors.

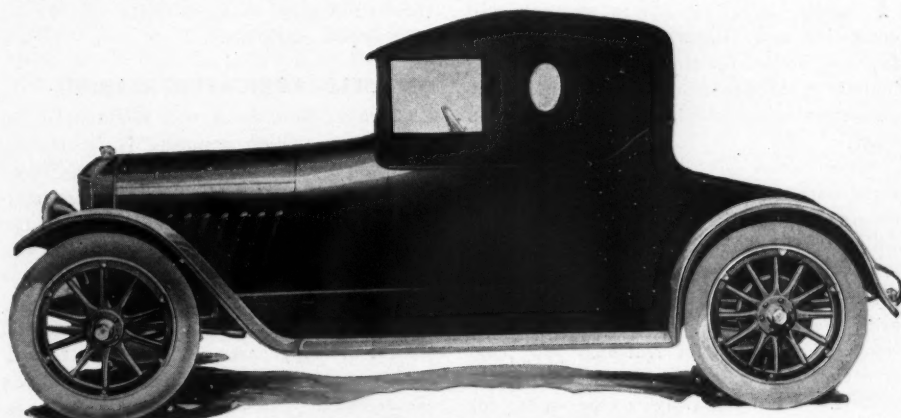
Entirely new material has been added, in the 1916 edition, on tractors and four-wheel drive forms, cyclecars, agricultural tractors, combination gasoline-electric drive, front wheel and four-wheel drive and steer systems and other important developments in power propelled vehicles.

Road Construction and Maintenance

Considerable detail is gone into on the general subject of road-building by the compilers of a 126-page book, Road Construction and Maintenance, published by the R. I. du Pont de Nemours Powder Co., Wilmington, Del., and although the book is designed primarily to promote the use of explosives in road construction, effort has been made to handle the subject in such a way as to make it an authoritative text book. Anyone among the readers of Motor Age, who is interested, may procure a copy of the book free of charge, if the name of this paper is mentioned.

Spell of the Holy Land

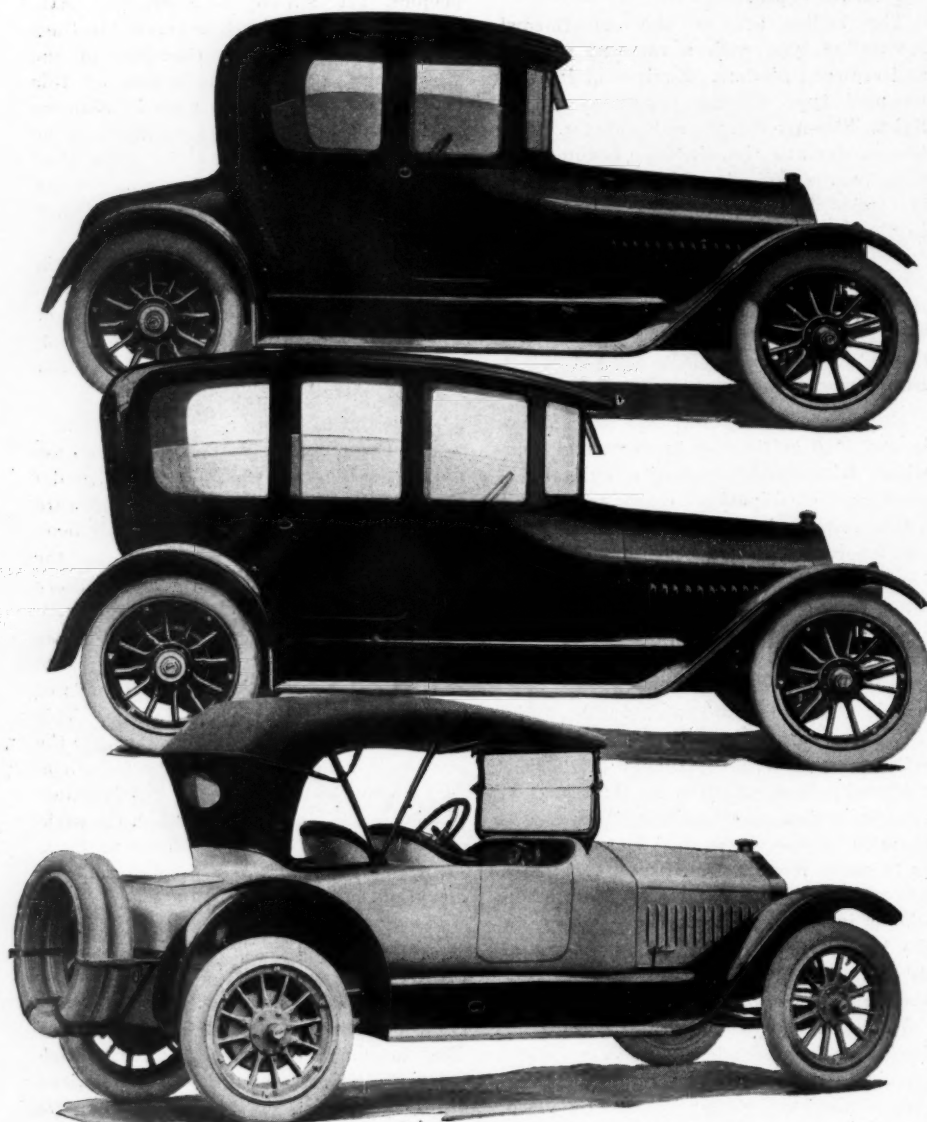
When one says Palestine, Jerusalem, Jordan or Jericho, one almost immediately associates these places with a holier-than-thou atmosphere, simply because that section of the world has given birth to three great religious creeds. To those who get this feeling, Archie Bell, author of the Spell of the Holy Land, published by the Page Company, Boston, price, \$2.50, net,



THE FARMACK CABRIOLET MODEL FOR 1916
Car with this type of body lists at \$1,155

Three New Body Types for the National Highway Twelve

Line Includes a Three-Passenger Roadster, a Four-Passenger Coupe and a Five-Passenger Sedan



NATIONAL TWELVE EQUIPPED WITH 1916 BODIES

The coupe at the top sells for \$2,650; the Sedan in the middle, \$3,250, and the three-passenger roadster at the bottom, \$1,990

THE National Motor Vehicle Co., Indianapolis, Ind., announces that it will equip its new Highway Twelve in three types of bodies for the 1916 season. These include a three-passenger roadster, a four-passenger coupe and a five-passenger sedan body.

These bodies have been designed to conform with the comfort that has been an inherent factor in National construction, which has been closely adhered to for several years past.

All three of these body types, which are shown on this page, follow out the same general trend of National body construction that has been noted in previous models. The Highway coupe sells for \$2,650; the sedan, five-passenger, has a center door on the right side and a forward

door on the left, and sells for \$3,200; the three-passenger roadster sells for \$1,990 with stock equipment.

SELF-LUBRICATING BEARING

Chicago, Nov. 8.—A new self-lubricating bearing, in which graphite is intimately mixed with the metal forming the bearing and in which bearing no other lubrication other than that afforded by the graphite is needed, has been brought out by the Dann Spring Insert Co., which is furnishing the bearing for small bushing work, such as spring eyes, universals and similar steering parts. The new self-lubricating metal known as Amalgamite is a compound in which the bearing metals are pulverized physically rather than being melted by heat. In this pulverized condi-

tion the metal is mixed with air-floated flake graphite, the metal and the graphite being pressed into a steel shell, which serves as a container for the bearing compound, many tons pressure being used in the work. Thus, instead of pouring the bushing, it is pressed into formation. The graphite is not in layers, spotted, put in depressions in the metal or held in the metal by any adhesive, but is mixed physically, so that the cellular structure of the metals is intimately mixed with the graphite, the theory being that it is a molecular mixture of the metal and graphite, so that graphite is a part of the warp and woof of the metal.

The development of this form of self-lubricating bearing dates back nearly 10 years and since then Amalgamite has undergone continual use as bearing metal in Diesel engines, lathes, shafting and many other parts. Certified private tests of Amalgamite have been made over long periods, in which tests the results have been highly satisfactory.

The field of Amalgamite in the motor car field is wide, there being many car parts that suffer, due to lack of attention in screwing down the grease cups regularly.

EMPIRE STATE PLANTS IMPROVE

New York, Nov. 5.—Evidence that the motor car and accessory manufacturers in New York state have made a large increase in activity and an improvement in business, which has been manifest all summer, appears in returns received by the state industrial commission from representative manufacturers throughout the state. In its September returns it had reports in the motor car group for twenty-six firms with 15,485 employees in the state. All but five of these firms were engaged in the manufacture of cars or parts. Those five firms together had less than 1,000 employees.

In July, 1915, 2.3 percent more people were employed than in June; in August, 1.5 percent more than in June; and in September, 14.4 percent over June. Comparing returns for each month this year with the corresponding month last year a remarkable improvement since last year appears. June returns show 27.2 percent more employees this year than last; July returns show 32.1 percent more employees; the August returns, 30 percent more employees; and the September returns, 47.4 percent more employees than last year.

A large increase in wages was made. Figures for that item show a progressive increase from June to September this year, 10 percent more wages being paid in the middle week of September this year than in the middle week of June.

Cummins-Monitor Has New Six—Will Continue Four

L-Head Motor in New Product, Having 3-Inch Bore and 5-Inch Stroke— Accessibility Noted Throughout

FOR the 1916 season, the Cummins-Monitor Co., Columbus, O., will add a new six-cylinder to its line, to sell at \$895, and continue the four-cylinder touring car and roadster models previously made, selling at \$795. The motor used in the six-cylinder model is an L-head, with a 3-inch bore and a 5-inch stroke, designed along the lines of accessibility and light weight.

Simplicity has been the watchword in designing the car. A simple system of brake equalization is used, which has proven very efficient in the test of the new six. The rear springs are three-quarter elliptic, underslung, with a swinging saddle, designed to prevent a solid impact when passing over very rough road. The effect of this spring suspension is said to be that the occupants of the car always feel that there are additional springs under the car. The springs are of extra length and width, and make for easy riding.

Tires are 33 by 4 inches, with non-skid in the rear. Wheels have large drums with internal expanding brakes and external brake, the latter being leather-covered to protect the linings from dirt and grit. The rear axle ratio is 4 to 1.

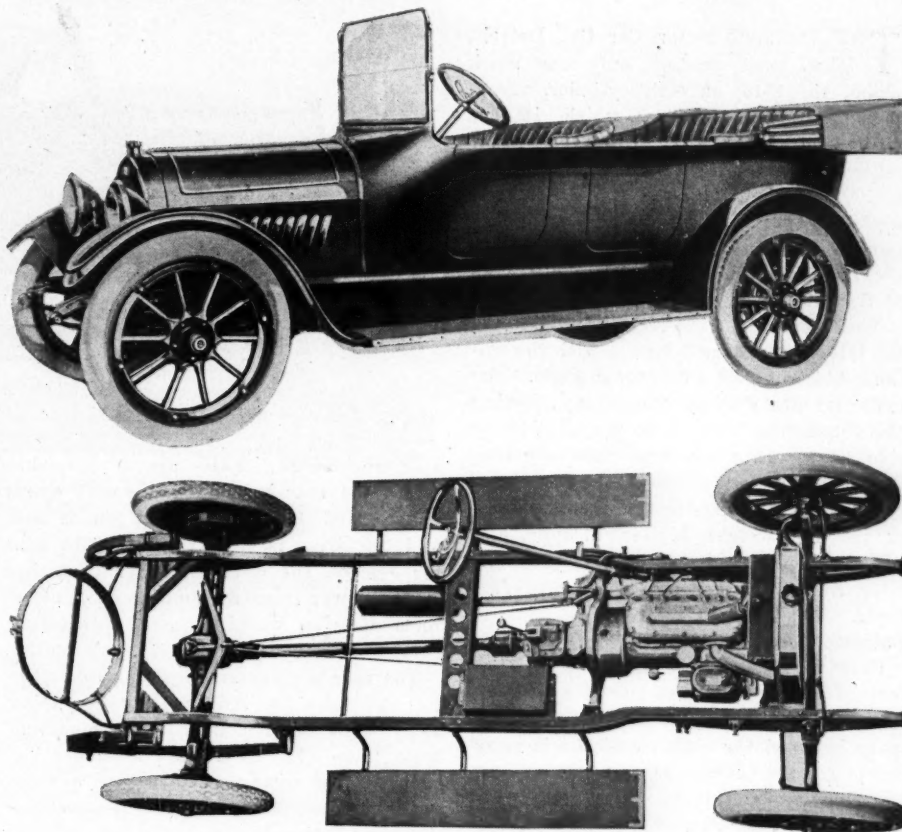
The body, which is mounted on a 115-inch wheelbase, has been designed to give ample room, both in the front and rear compartments. Upholstering is in genuine leather and the cushions are built with extra deep springs and with a gradual slope toward the back. The body is finished in brewster green with dark blue as an option, with the rest of the car in black. Vacuum-gravity fuel feed is employed, the gasoline tank being in the rear.

Changes in Four Slight

Very slight changes are to be noted in the four-cylinder models. The 4-30, which has a 108-inch wheelbase, is built along the streamline design. Fuel is carried in the rear of the roadster and under the cowl of the touring car. The motor used in the four is a Golden, Belknap and Swartz, 3¼ by 4¼. Cylinders are block-cast, with removable head. Lubrication is by force feed to the main bearings, but the splash system is used for the other parts.

Cooling is obtained by thermo-syphon, and the clutch is a multiple disk, with center control. Selective gearset with three speeds forward and one reverse is employed. The motor has a three-point suspension and the gears are made of chrome nickel-steel.

The rear axle is a Russell floating type, with 1¼-inch shafts. The differential gears are special heat treated. Hyatt roller bearings are used in the axle and the



VIEWS OF FINISHED MONITOR AND OF THE CHASSIS

A new type of brake equalizer is shown just over the rear axle in the lower illustration

driving shaft. Brakes are inclosed to prevent mud and dust from reaching the linings. The steering gear is of the irreversible type and has a 17-inch wheel.

Splittorf ignition is used and a 12-volt Disco electric generator and motor is used for cranking and lighting. Tuthill Titanic semi-elliptic springs are found in the front of the four and three-quarter elliptic in the rear.

Speedometer, ignition switch, ammeter and lighting switch are carried in a unit case on the instrument board and are illuminated at night by a dash lamp. The windshield is rain-vision, ventilating. Tires are 32 by 3½, non-skid in the rear, with demountable rims and one extra rim goes with each car.

SPRINGFIELD BODY TO DETROIT

Springfield, Mass., Nov. 5—Last Tuesday 330 employees of the Springfield Metal Body Co. went on strike. They demanded 8 hours and the recognition of the union. It has always been the policy of this company to have an open shop, working 10 hours. Without giving the owners a chance to arbitrate, the strikers walked out and no conference has been had to date. For some time the moving of the plant to Detroit has been contemplated in

view of the fact that the larger part of its business now is with Detroit motor car manufacturers.

Two different plants in Detroit have been offered to the Springfield company and the principals now are there going into the matter very thoroughly.

Unless the strikers return to work it will be necessary to move the machinery at once, as the company has a large number of factory orders on hand for quick delivery.

MARKET FOR CARS IN INDIA

New York, Nov. 5—There is a good market for small cars in India, according to a report given out by a local man. A reply, given him by a friend in India who had been asked for information in regard to the sale of cars in that country, stated that there were already many small cars and that it is probable that a good market could be made there for the right car at the right price. The purposes to which it would be put are many and varied. It would be used daily for journeys between the bungalow, club and office. These journeys will probably be on moderate roads, carrying an assorted traffic of men, cattle and bullock carts, and these neither know nor obey any rules of the road.

Monarch Brings Out Eight-Cylinder Model Only for 1916

"Car with Silver Wheels" Is the Unique Name Given to This New Product—
Equipped with Herschell-Spillman 3 by 5 Motor

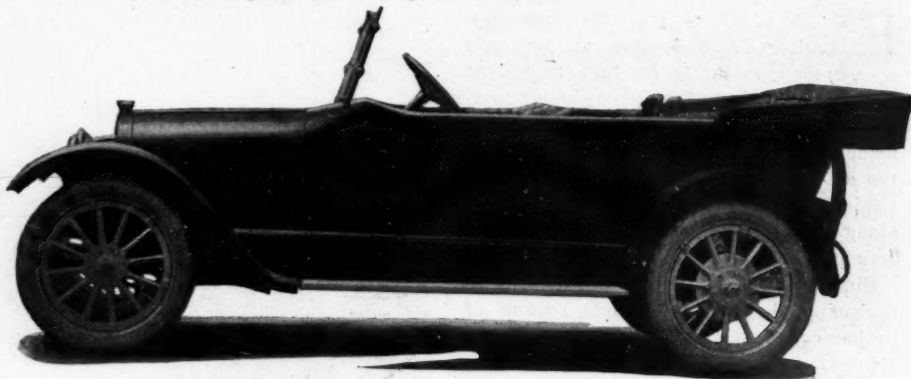
THE Monarch Motor Car Co., Detroit, Mich., will produce only one stock model for 1916, an eight-cylinder, seven-passenger, touring car, which it has christened "the car with the silver wheels." The price remains the same—\$1,500. Mechanically the car is the same model as previously brought out, but a number of refinements have been made in the body and finish to bring the car up to the latest design.

The motor is a Herschell-Spillman of the latest type, 3 by 5 inches, with the cylinder blocks set at a 90-degree angle. The cylinders are slightly staggered, allowing the connecting rods to be placed side by side on separate bearings, thus avoiding the yoke-end construction on the first eight-cylinder cars. The motor is essentially of the light-weight, high-speed type, and will develop upwards of 74 horsepower at 2,400 r. p. m., according to its manufacturer. Two mufflers are used.

Extreme Accessibility

Extreme accessibility has been made a feature of the motor, as shown by the illustrations of the motor and chassis. The space between the cylinder blocks is clear except for the carbureter, power tire pump and ignition, and these parts are so arranged that easy access is had to all the valves. The water pump, generator and starting motor are in accessible positions on the sides of the crankcase.

The gearset on the new model is made by the Detroit Gear & Machine Co., and is in unit with the motor. Drive is by tubular shaft through a double universal of



THE MONARCH EIGHT FOR 1916

Called "car with silver wheels," and has a Herschell-Spillman 3 by 5 motor

standard design. Axles are of Columbia make, the rear being floating with spiral bevel gears. Gemmer steering gear is used and the drive is from the left with center control, the gearshift lever operating on the power transmission direct. A more-room steering wheel is used, facilitating getting in and out of the driver's seat.

The rear springs are three-quarter elliptic and take the driving stresses, doing away with the necessity for torque and truss rods. The brake rod assembly has been altered somewhat to secure a thoroughly accessible and powerful construction, and both sets are on the rear wheels. The frame has been altered so as to have a slight kick-up in the rear.

The carbureter is a Zenith of the duplex, eight-cylinder model, and the ignition is by Atwater-Kent automatic advance system. Starting and lighting is Ward-Leonard, especially adapted to the Monarch car with flywheel application through a Bendix driving pinion. The two-unit system is used, with the motor for starting separated from the generator for lighting. Fuel feed is by Stewart vacuum system. The gasoline tank is in the rear and has been increased in capacity.

Has Distinctive Appearance

In appearance the body closely resembles the popular streamline, but is so finished in its details as to escape the commonplace. The windshield is slanting, increasing the long, racy effect of the flowing body lines. The front seats are divided, making one unit of the whole body, and the auxiliary seats fold against the back of the front seats, when not in use for extra passenger.

Upholstery is flush type, and of genuine, long-grain leather, being cut away from the back of the front seats, giving the effect approaching that of the double cowl body. Fenders are crowned and rounded to the curve of the wheels, which are aluminum finish, giving the car its unusual name.

The wheelbase of the Monarch is 125

inches. Tires are 33 by 4½, safety tread in the rear.

HIPPO GARAGES PATRONS' CARS

Boston, Mass., Nov. 6—Free garaging for the motor cars of patrons, is a new policy announced by the Boston hippodrome, formerly Keith's National.

The cars are run into a large garage next door to the hippodrome. This garage belongs to a taxicab company, but as all of the cabs are on duty during the evening theatre hours, the garage is able to shelter all of the theatre cars without confusion.

ALUMINUM PISTONS AND OXYGEN

Chicago, Ill., Nov. 5—The increasing use of pistons of aluminum alloys in motor car engines has brought up a new problem which engineers heretofore have disregarded. Arguments advanced by a thoughtful motorist recently have dropped in the engineering body what almost amounts to a bomb. The seemingly innocent question, which is still far from being answered, was: "Is it safe to use an oxygen decarbonizing method when the pistons are of aluminum alloy?"

Not a single engineer has yet dared answer this in the affirmative. Aluminum does oxidize much quicker than iron in an oxygen atmosphere, and tests will have to be made to show just how much more rapid such oxidation is under the great heat of the oxygen-acetylene flame. If these tests prove what engineers fear, then another method of decarbonization is needed—or aluminum alloy pistons will have to be abandoned.

NEW PARTS COMPANY FORMED

Milwaukee, Wis., Nov. 6—A. M. Seenichsen, one of the founders of the Auto Parts Mfg. Co., Milwaukee, Wis., has resigned as general manager to organize the A. M. S. Co., manufacturer of parts and accessories. G. W. Browne and T. C. McMillan are associated with Mr. Seenichsen. A factory is being established.

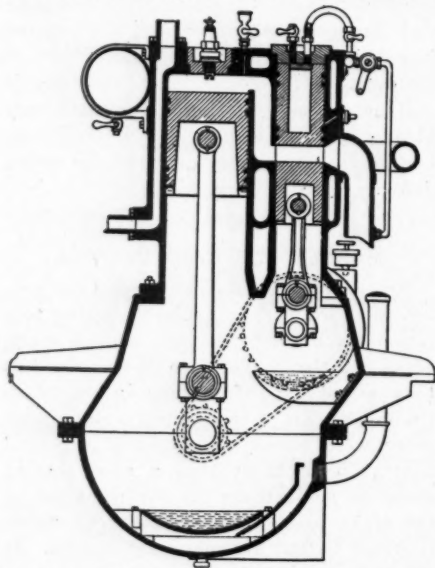
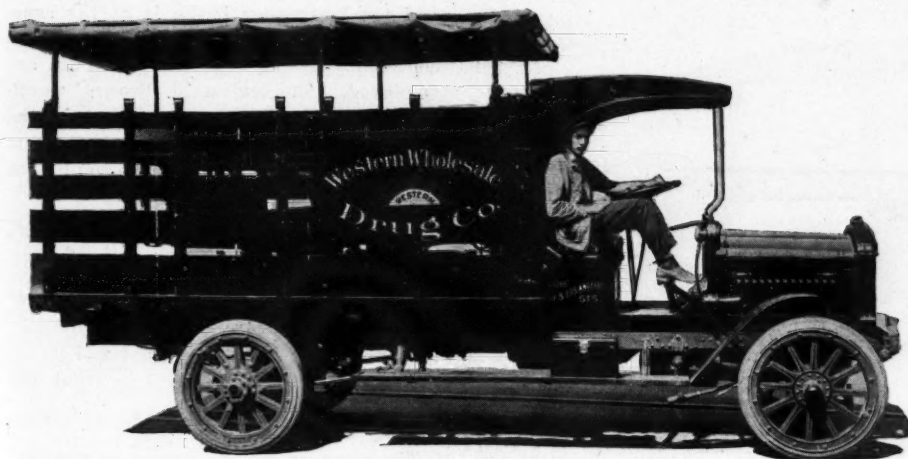


FIG. 2—CROSS-SECTION OF STEWART MOTOR

Piston valves are driven by a short crank throw and connecting rod from an auxiliary shaft employing a silent chain from the crankshaft

Price Reduction of Moreland Distillate Trucks Announced

One-Ton Is Cut \$300; 1½-Ton \$350; 2½-Ton \$400 and 4-Ton \$450—
Factory Capacity Increased Two and One-Half Times



MORELAND DISTILLATE MOTOR TRUCK

This line of trucks, of which there are four, uses either distillate or gasoline as fuel

THE Moreland Motor Truck Co., maker of Moreland distillate trucks, Los Angeles, Cal., has announced a sweeping reduction in prices for the coming year. Its line includes a 1-ton, 1½-ton, 2½-ton and a 4-ton, the old prices of which were \$1,850, \$2,200, \$2,800 and \$3,650, respectively. The new prices are \$1,150, \$1,850, \$2,400 and \$3,200 respectively.

Continental, four-cylinder motors are used in the full line except for the 4-ton model, which employs a special motor of Moreland construction. The 1-ton Continental motor has cylinder dimensions of 3¼ by 5, the 1½-ton model has cylinders, 4½ by 5¼, while the 2½-ton Moreland uses a motor measuring 4½ by 5½. The Moreland motor used on the 4-ton has a bore of 4¾ and a stroke of 6¾ inches.

Use Moreland Gasifier

All of the motors are fitted with the Moreland gasifier, a fuel economizer produced by the Moreland company. Proceeding on the theory that No. 1 engine distillate, a clear, colorless liquid with a gravity test of 48, and selling at an average retail price of 6 cents a gallon, was the cheapest fuel to be had on the Pacific coast, the company developed the gasifier to take care of the heavier fuel. The action of the gasifier is simple. It is made of cast iron to give it heat-holding qualities and the exhaust and intake manifolds are cored through the outer shell, which completely envelops them. Fresh air is drawn through holes drilled in the top of this outer shell, directly upon the exhaust and intake manifolds, and this air, now heated, is drawn down into the air intake of the carburetor, heating the intake manifold at the same time. The fresh, warm air readily vaporizes the distillate in the carburetor, with the result that the mixture is carried through the warm intake manifold.

Thermo-syphon cooling is found in the 1-ton and centrifugal pump system in the other three models. Combination pump and splash lubrication is found in all models, although the 1-ton has a special pump, the 1½ and 2½-ton models a double pump and the 4-ton a geared pump. Bosch ignition is found throughout the line. A multiple disk, asbestos to steel is used on all four models.

The sliding gearset is fitted with Timken roller bearings in each model, but the two smaller have but three speeds forward, while the two larger have four. A worm-driven rear axle is found throughout the line. Semi-elliptic springs, both front and rear, are found on all types of the Moreland. Timken axles are used both front and rear, the latter being of the floating type. Two separate systems of brakes are employed, both on the rear wheels. The wheelbases of the four models are 126, 150, 168 and 186 inches, respectively, for the 1, 1½, 2½ and 4-ton models.

Tires are 34 by 3½ front and 34 by 4 rear, on the smallest model, with an option of pneumatic tires with demountable rims if desired. On the next model the front tires are the same as for the 1-ton, but the rear are 34 by 5. For the 2½-ton, 34 by 4, front, and 34 by 4, dual, rear, are offered, with an option of 36 by 6, single in rear. The 4-ton uses 36 by 5, single, in front and 38 by 5, dual, in the

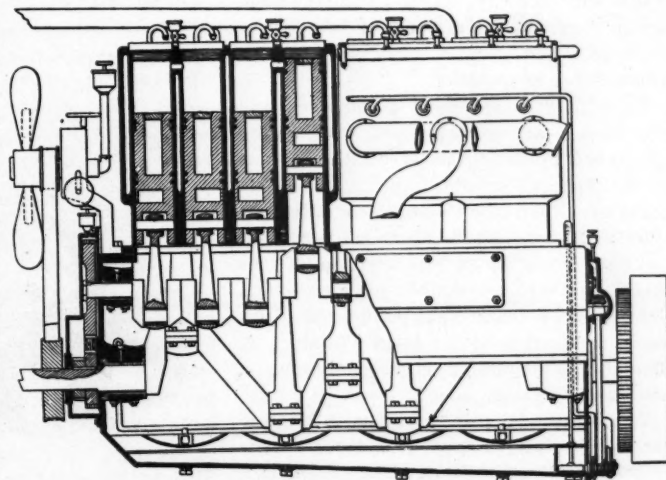
rear. Treads vary, the 1 and 1½-ton models being 56 and 58 respectively; the 2½-ton, 58 inches in front and 60½ in the rear, while the 4-ton is 62 inches in front and 70 inches in the rear. The chassis is finished in a priming coat and two coats of grey lead. The equipment includes mechanical horn, full set of tools, including jack, grease gun and all necessary wrenches.

BRINGS OUT STEWART MOTOR

A new internal combustion engine which has several features of interest, including a device for air braking recently has been patented by E. U. Stewart, Long Beach, Cal. The motor is shown in section on this page. The object of the motor is to eliminate the poppet valve and to secure more even compression at all times by using piston valves instead. It also is hoped, by the use of the piston valve, to increase the efficiency of the motor without the addition of weight.

One of the purposes of the piston valves, which are clearly shown in the illustration, is that in making their working strokes they will pump air on the descending stroke and on the ascending stroke they will force the air into a storage tank attached to the engine. The general purpose of this air is for the operation of air brakes, it being one of the inventor's ideas that it would not be necessary to use the foot or hand brake on long descents.

The air also is supposed to be used for starting the motor, inflating tires, cleaning and dusting the car, raising an air jack, and any other purposes for which compressed air in a clean, pure condition may be employed. The overproduction of air passes through the exhaust to keep it clean.

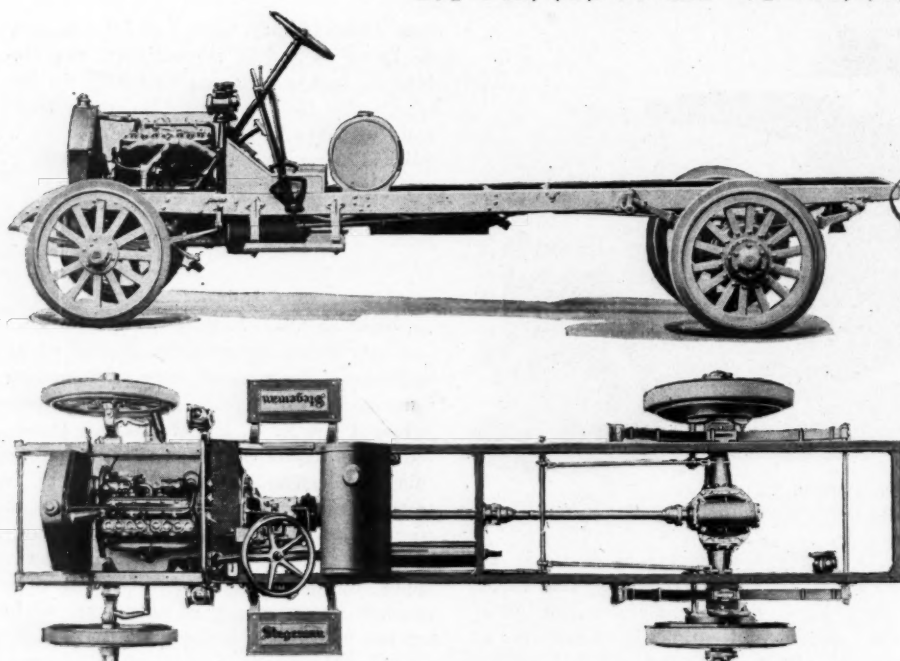


SIDE VIEW SECTION THROUGH STEWART MOTOR

Internal combustion engine has device for air braking and eliminating poppet valves

Stegeman Worm-Driven Trucks Include Two Fours and a Six

Continental Motors Used in All Three Models—1½-Ton Is \$1,900,
2½-Ton, \$2,500 and 4½-Ton, \$3,000



TWO VIEWS OF THE STEGEMAN CHASSIS

The upper illustration shows clean appearance of frame and the lower how the power is transmitted to the rear axle

THE new line of worm-driven trucks announced by the Stegeman Motor Car Co., Milwaukee, Wis., employs the same style of motors as was used formerly in the chain-drive vehicles brought out by that concern—Continental. In the 1½-ton and 2½-ton trucks, a four-cylinder motor with a 4½-inch bore and a 5¼-inch stroke, developing 35 horsepower, is used, while the 4½-ton machine is equipped with a six-cylinder, 50-horsepower motor, having a bore of 3¾ inches and a stroke of 5¼ inches. This is a new departure in motor truck construction, but the maker of Stegeman trucks declares that the six-cylinder motor will do away, largely, with the damaging internal vibration on the large machine.

Three-Point Suspension

Three-point suspension is employed and the motors all are equipped with sealed governors limiting the speed to 1,100 r. p. m. The car speed of the 1½-ton is 18 miles per hour, the 2½-ton, 15 miles per hour and the 3½-ton, 12 miles per hour. Lubrication is by a combination of the splash system and double plunger pump. Cooling is by centrifugal pump, gear driven, in connection with a large radiator. A Stromberg carburetor is used, having a hot-air connection.

The gearset is built in unit with the motor, is of selective type with three speeds forward and one reverse. The clutch is a multiple disk, dry plate. An Eisemann high tension magneto, with automatic spark advance, is found on each model of

the Stegeman. The steering gear is a Ross irreversible, worm and nut type. All three models have left drive and center control. The throttle is foot-operated and there are no levers on the steering column. The clutch and service brake are combined into one foot pedal.

The frame is pressed steel, channel section. In the 3½-ton Stegeman, the frame is reinforced by nickel-steel truss rods. The standard wheelbase of the 1½-ton is 150 inches; of the 2½-ton, 144 inches, but this model may be equipped with a special long wheelbase, which measures 162 inches. The wheelbase of the 3½-ton is 156 inches.

The service brake is of the internal expanding type, acting on the propeller shaft

and the emergency brake is of the same type, but operates on the rear wheels. Exceptionally strong Timken front axles are employed. Timken-David Brown, worm-gear, floating axles are employed in the rear, the driving reduction on the 1½-ton truck being 7¾ to 1, on the 2½-ton 9¼ to 1 and on the 3½-ton 10.3 to 1.

Exceptionally long and flexible springs are used on all three models. All are semi-elliptic, and made of magano-silicon steel. The front springs of the 1½-ton are 48 inches by 2¼ inches; the rear, 54 by 2¼; the 2½-ton, 42 by 2½ in front and 60 by 2½ in rear; 3½-ton, 46 by 3 in front and 60 by 3 in rear.

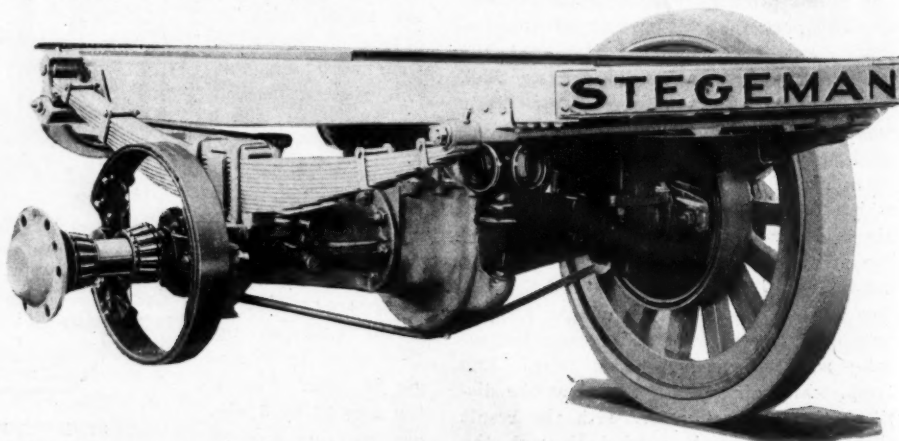
Variety of Tire Sizes

The standard tire equipment on the 1½-ton machine is 34 by 3½ solid front tires and 36 by 5 solid rear. On the 2½-ton, 34 by 4 solid in front and 36 by 4 dual solid in rear. The 3½-ton truck is equipped with 36 by 4 solid tires in front and 40 by 5 dual solid in rear. The standard tread of the 1½-ton is 56½ inches; the 2½-ton, 58 inches and the 3½-ton, 65 inches. However, a special country road 2½-ton is offered with a tread of 56½ inches.

The chassis weights of the 1½, 2½ and 3½-ton models are 4,200, 5,000, and 6,000 pounds, respectively, and the price, in the same order, \$1,900, \$2,500 and \$3,000. Any style of body will be supplied to order.

SHIPMENTS 15,972 CARLOADS

New York, Nov. 5—At the regular monthly meeting of the board of directors of the National Automobile Chamber of Commerce, Inc., held at the headquarters here yesterday, the traffic committee reported that October shipments of motor cars amounted to 15,972 carloads, as compared with 10,443 carloads shipped in October, 1914, or an increase of over 50 per cent. In September, of this year, shipments amounted to 17,190 carloads.



REAR AXLE OF STEGEMAN TRUCK

Note internal expanding service brake and the sturdy spring suspension

Koehler 1-Ton Truck at \$895—Delivery Body for General Use

Designed to Meet General Demand for Full-Ton Carrying Capacity and Speed—Plan to Produce 2,000 for 1916

SPECIALIZING in one type of chassis for a four-cylinder, shaft-driven, full-ton capacity truck, the H. J. Koehler S. G. Co., Newark, N. J., plans a minimum output of 2,000 machines for the 1916 season. This concern's product, known as the model K, sells for \$895, has a wheelbase of 129 inches, is equipped with a complete, roomy, flare-board type of body, perfected for the purpose of meeting a general demand for a full-ton carrying capacity. Besides, the truck is designed for speed, assuring rapid transportation.

The power plant is of the unit type, combining the motor, clutch and gearset. Three-point suspension is used. The four-cylinder motor has a $3\frac{1}{2}$ -inch bore and a 5-inch stroke, is of the valve-in-head type, and develops 30 horsepower. Cylinders are block-cast, the upper part of the crankcase being cast integral. A jacketed cylinder-head contains the entire valve arrangement for the four cylinders and is easily removed. An important feature of the motor is that the exhaust gases have a quick outlet to the manifold, separate from the cylinder-head, thereby giving immediate explosion of the exhaust heat from the cylinder-head ports, allowing valves and adjacent parts to be cooler and taking a burden from the cooling system.

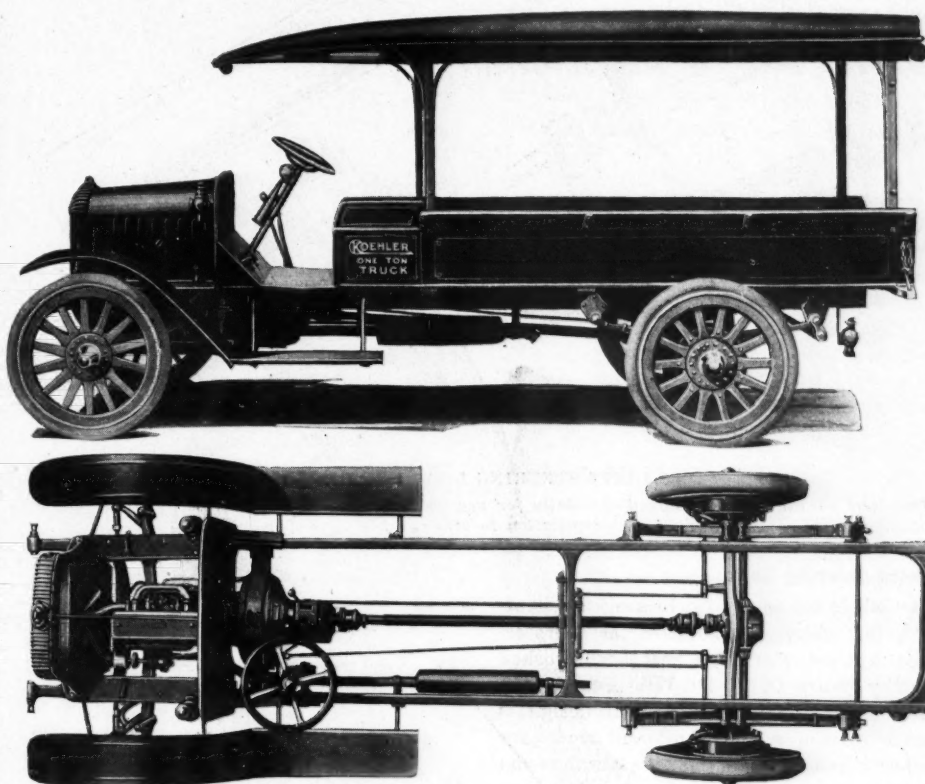
Force feed lubrication is used, a positive gear pump forcing the oil from the crankcase reservoir to all working parts, from which it later filters back to the reservoir after being strained. Valves are large and interchangeable. Connecting rods are long, I-beam section. The camshaft is in one piece. The crankshaft is supported by three bearings, 2 inches in diameter. Crankshaft and connecting rod bearings are of bronze, shell-type faced with nickel babbitt.

Uses Cone Clutch

A cone-type clutch is housed with the flywheel and the gearset. Three speeds forward and one reverse are offered. All gears are made from an alloy steel containing proper parts of nickel and the shafts are mounted between annular ball bearings.

A special radiator is used which employs separate top and bottom tanks with side members bolted together around a vertical tube core, or cooling section. The top tank is heavily ribbed, adding much cooling surface to the 9,500 square inches of surface represented in the core itself. Back of the radiator is an 18-inch fan, driven by a flat belt.

A special feature of the spring suspension is the use of graded springs, both in front and rear. These springs are built up of four different thicknesses of leaves.



TWO VIEWS OF THE 1-TON KOEHLER TRUCK

The top shows complete body, which goes with the \$895 price, while below is given the chassis. The latter sells for \$870

Clip plates and pads are provided for each spring mounting on the axles and large carbon steel clips are used to prevent breakage of springs.

The internal gear drive type of rear axle is employed, all working parts of which are mounted on heavy-duty roller bearings. Both front and rear wheels are 34 inches in diameter. Left drive and center control are found on the Koehler. Eight feet, 6 inches of space are offered back of the driver's seat. The floor of the body is close to the ground, thus facilitating loading and unloading. The Koehler is finished in green for the hood and body and amber brown for the running gear.

JEFFERY FOUR A SEDAN

Racine, Wis., Nov. 8—The Thomas B. Jeffery Co. announces that it has gone one step farther with the Jeffery four at \$1,000, and entered this car in the closed car field, equipping it with a sedan top. The new sedan has all the richness of finish and graceful lines that have characterized inclosed cars, yet the price is only \$1,165. The sedan top is detachable, so the car may be converted into an open machine with the coming of warm weather.

The contour of the new top, which is

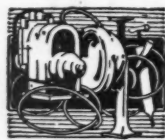
part of the Jeffery sedan, harmonizes with the body proper. The roof is of laminated wood construction, covered with a fine quality of top material. The rear section of the body of the top is metal, and the supports and sills are of a substantial character. It weighs 200 pounds. The glass in the windows is crystal plate, ground and polished. The glass in the forward windows and in the doors is arranged to drop half way down. Silk portiere curtains are provided.

JACKSON TRAILER ANNOUNCED

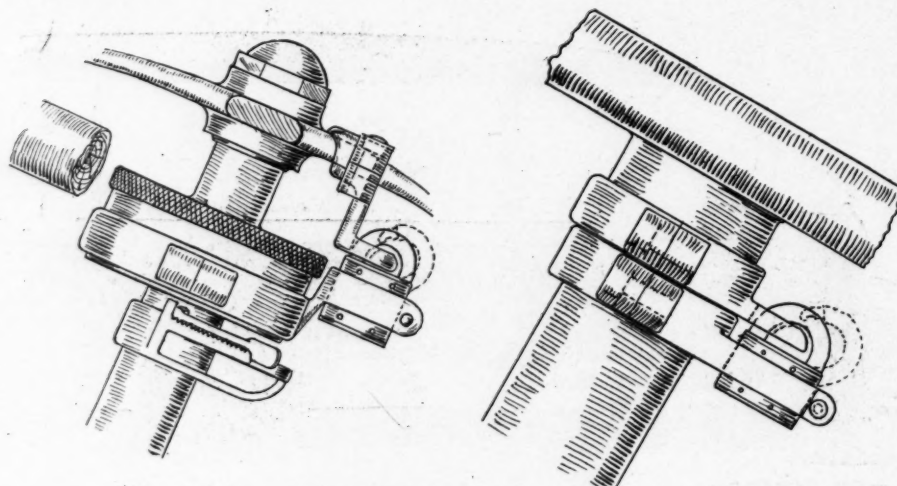
Jackson, Mich., Nov. 8—The Jackson motor trailer is the latest product of the Miles Mfg. Co., of this city. The trailers are made for use by any car. There are three different types, each with several models. Prices range from \$38 to \$98.

GUNN U. S. TIRE PRESIDENT

New York, Nov. 6—E. S. Williams, president of the United States Tire Co., has resigned and will devote his exclusive attention to the mechanical rubber business of the United States Rubber Co. J. Newton Gunn, assistant to Colonel S. P. Colt, president of the United States Rubber Co., has been made president of the tire company.



The Accessory Corner



DIETZ STEERING LOCK DEVICES

The view on the left is designed especially for use on Ford cars while that on the right is for application to other makes

Deitz Steering Lock

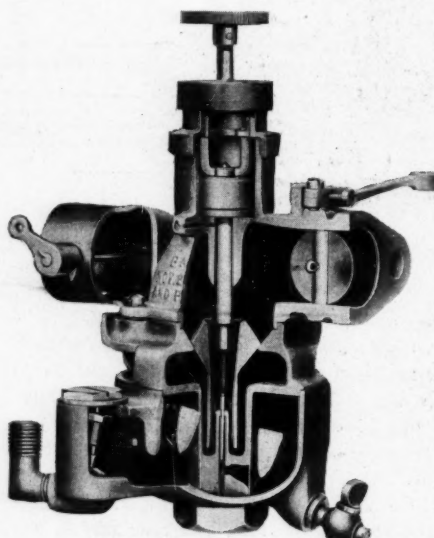
A SIMPLE device for locking the steering wheel of a motor car as a protection against theft has just been worked out by Henry Deitz, 416 West Fourth avenue, Denver, Colo. A special design is made for Fords, and a different model for other makes of cars. The general model consists of two metal clamps for the steering post, with a small padlock firmly bracketed in the lower clamp and three attaching rings as a part of the upper clamp. This arrangement provides for locking the steering post whether the car is standing with the wheels set straight ahead or whether it is left in such a position that the steering wheel is turned to the right or left. This makes the device easy to use if the car is driven up to the curb and left hurriedly without squaring the position of the wheels. The Ford model is similar in working principle, but here the upper clamp is fastened directly to an arm of the steering wheel. For locking in different positions, this model must depend upon three lock brackets on the lower clamp.

These clamps can be made of either forged steel or hard bronze, and are fastened by a patent device which will prevent removing them with a screwdriver or any ordinary tool. A small spring holds the bar of the padlock in the clear when open, thus guarding against its being jarred shut and catching the clamp which turns with the steering wheel.

The locking device sells for \$2.50, complete, for any make of car.

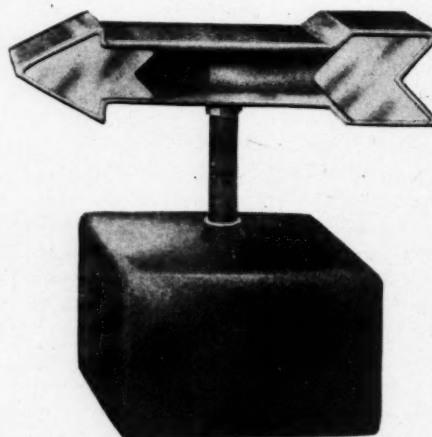
Arrow Traffic Signal

The Auto Arrow Signal Co., St. Louis, Mo., has brought out a traffic signal device, consisting of two metal motor boxes about 3 inches wide, 3½ inches deep and 5½ inches long, with black enamel finish,



DRIP PROOF CARBURETER

The main design is on a simple, approved principle with a lifting valve to control the mixture



ARROW TRAFFIC SIGNAL

Nickel plated pointer, electric lighted, show which way motorist intends turning

containing electrically controlled mechanism; one box being secured near the top of the radiator front by a clamp and the other being placed on the rear of the car in any place desired. Each of these boxes is equipped with a nickel-plated arrow, 8-inch in front and 6½-inch in the rear. Within the arrows are electric bulbs for illuminating them at night.

The action of the arrows is controlled by a set of three pushbuttons clamped to the steering wheel or post. It is not necessary to hold the buttons down, as the device locks itself in position until another button is pushed. In addition to the arrow the rear part of the device is fitted with a disk on which is the word "stop," this being illuminated at night.

Drip Proof Carburetor

Two new and extremely ingenious features are to be found in the Diamond carburetor, made by the Diamond Carburetor Co., Jersey City, N. J. The main design is on a simple, approved principle with a lifting valve to control the mixture. As is seen in the cut this valve controls both air and fuel passages, as it has a metering pin attached to it which varies the nozzle orifice as the valve rises or falls. At starting, the whole of the air passes downward in the central well and then up through the hole pierced through the middle of the valve. When the engine picks up speed the valve lifts and the air stream then divides, so that the velocity of air actually passing the nozzle does not vary very much. The metering pin lifts with the valve and thereby increases the size of the jet, calculation so proportioning the size of the pin as to secure a constant ratio between the air and gasoline admitted.

When idling, or when starting with the strangler closed, gasoline collects in the bottom of the well around the foot of the nozzle and the air bubbles through and provides a whiff of very rich gas to give acceleration as the throttle is opened up. This feature is well shown by demonstration which the makers are giving on an old Ford, which exhibits a great ability on high gear in heavy traffic.

To steady the action of the valve a dashpot is needed, and a common fault of such dashpots is their tendency to stick. The inventor of this carburetor has hit upon the happy idea of using a solid block of graphite for the plunger which is therefore everlastingly self lubricating. Another clever feature is that the carburetor cannot leak or drip, as there is no outlet or intake below the level of the throttle. With an air pipe securely attached the carburetor will even operate under water. There is only one adjustment, this being on the metering pin and a control goes from this to the dashboard.

Being a simple manufacturing proposi-

tion the carbureter is sold for the low price of \$12.50, and it is made in sizes to suit several different makes of cars.

Oakes Kranklock for Fords

The Kranklock, made by the Oakes Co., Indianapolis, Ind., is a combination starting crank holder and license plate bracket designed to fit on the center bolts of the Ford front spring, making its attachment simple and rigid. Its advantages are that it holds the starting crank upright and rigid as shown in the accompanying illustration; that it can be locked, thus making the car theft-proof, and also that it holds the license number securely in a correct position.

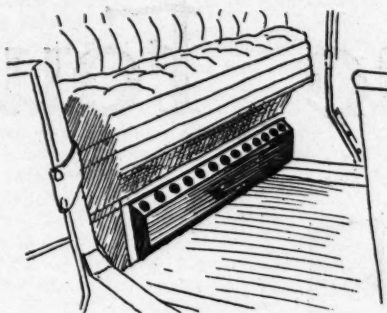
U. S. E. Shock Eliminator

The U. S. E. shock eliminator and bumper combined, made by the Universal Shock Eliminator, Inc., New York, is a mechanical device which is attached between the frame of the car and the springs. It consists of a metal casing in which are assembled spiral springs having between them a reciprocating trunnion ring attached to the main connecting rod. This connecting rod, being joined to the lever, which is pivoted at one end of the shock absorber and at the other end to the car spring, receives the force of the shock from the car spring and transmits it to the spiral springs of the shock eliminator where it is absorbed by their reciprocating action. The bumper, which is a part of the front U. S. E. shock eliminator, is connected with the internal springs so that any blow received by the bumper is absorbed by their action. The prices for the front pair, including bumper, is \$60; rear pair, \$50; rear pair underslung, \$40; small car equipment, \$80, and for attaching complete, \$10.

Duplex Carbureter

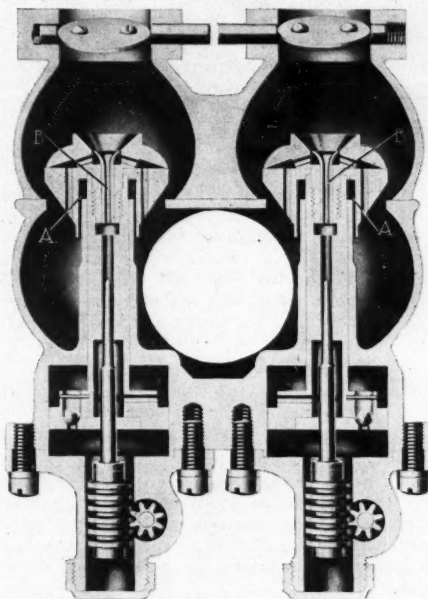
To meet the demands for eight and twelve-cylinder motors the Detroit Lubricator Co., Detroit, Mich., is manufacturing the Stewart Duplex carbureter which, in reality, is two carbureters in one. The principle of the single Stewart carbureter is followed, but all the essential elements such as the metering pins, metering valves, mixing chambers, throttles, and adjustment, are all separate. In order to obtain uniform results in both sides of the V, this duplex model is so arranged that the throttle and adjustment can be perfectly synchronized, thereby equalizing the two motor sets. The only function which is the same for both sides of the carbureter is the float bowl and the mechanism which keeps the gasoline at a constant level. There also is a single air intake port which works from a single hot air tube and stove.

The Duplex carbureter is illustrated in sectional view in this department. The carbureter operates on a metering principle which readily can be understood from the sectional view. With the motor at rest the main air passages are closed because the air valves A rest on their seats. As



THE AUTO-RAD

Car heating device which weighs but 4 pounds



DUPLEX CARBURETER

Valves A are closed when motor is at rest. Fuel is drawn in through aspirating tubes B



KRANKLOCK FOR FORD CARS

Offers a combination of uses and easy installation

soon as the engine starts to rotate a vacuum is formed lifting these valves from their seats, admitting air and drawing gasoline through the aspirating tubes, B; a small amount of air is drawn through the primary air passages and up around the flared top of the aspirating tube. This flare on the end of the tube is for the purpose of spreading gasoline in a film in which condition it is picked off the rim by the air which passes this point at a high rate of speed.

The more the throttle is opened the more the air valves will lift, and the more gasoline will be allowed to pass by the tapered metering pins. The higher the valves are lifted the greater will be the opening around the metering pins, thus increasing the gasoline supply. The only adjustment possible in this carbureter is that of the relative position of the metering pin to the opening in the bottom of the aspirating tubes, and when this is once made it should be permanent.

Auto-Rad Car Heater

A radiator for heating the car has been brought out, under the name of Auto-Rad, by the Brevando Mfg. Co., Rochester, N. Y. The maker claims that the exhaust of an ordinary 40-horsepower motor would heat an eight-room house, and there is no reason why a portion of this should not be taken for making the car comfortable in winter. The radiator consists of an enameled steel casing inclosing the radiating surface, thus permitting a circulation of warm air around the feet and under the body. The weight is given by the manufacturer as 4 pounds. The upkeep cost for fuel is nothing since the exhausted gas which otherwise would pass out into the open simply is led through the radiator. Since the radiator is gastight the device is clean and odorless. The price is \$6.

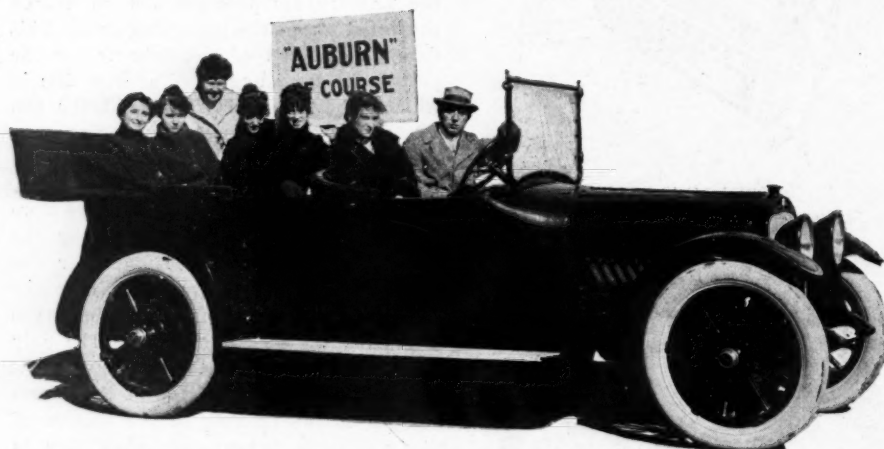
Die Cast Babbitt Bearing

A die-cast bearing of compressed babbitt, with a steel frame inserted deep within the babbitt, for stiffening the strengthening, has been put upon the market by the Stewart Mfg. Co., Chicago.

This bearing is said by engineers to be a truly remarkable construction, one that will solve most bearing problems. Already it is being used extensively in several cars and in other machinery where good bearings are important.

A steel insert is set within the metal of the bearing itself, in such a manner that the babbitt is much heavier on the surface toward the shaft than it is at the back. The thin babbitt coating at the back serves to act as a cushion for the seating of the bearing, into whatever slight inequalities there may be in the machining of the backing. This reinforcement not only gives the bearing maximum rigidity, making it rival the old bronze bearing in wearing qualities, while it reduces bearing costs considerably, but as it is die-cast under pressure the composition of the casting is remarkably compact and strong.

From the Four Winds



AUBURN MODELS OF VARIOUS YEARS—Above are shown seven auburn models—one the six for 1916. The six hails from the plant of the Auburn Automobile Co., Auburn, Ind., while the other six hail from Fort Dodge, Ia., chosen, because of the auburn tresses which they owned, as being quite well fitted to grace the 1916 car whose name corresponds with their locks. The event was the Fall Festival parade at the Hawkeye city. It seems probable that if the driver's hair was auburn he would have let it into the picture—perhaps—well sometimes people speak of their hair, not as having color, or length, but use, instead, the past tense of "go."

REMODELED Cars Are Trucks—In the future remodeled motor cars will be classed as trucks by the Michigan secretary of state. Attorney General Fellows has rendered an opinion that when the body of a car is remodeled to meet truck requirements the car must be classed as a truck.

Iowans Spend \$36,000,000 for Cars—Reports to state officials from Iowa motor car dealers show that the farmers of Iowa have spent \$36,000,000 this year for new cars. This is a substantial increase over the purchase of 1914 and shows the general prosperity of the state in an unmistakable way.

Garage of License Plates—Herbert Johnson, Winsted, Conn., plans to build a garage that will rank among the novel and unique buildings of the country, in that it will be constructed with unused motor car registration plates, recently given him by the state of Connecticut. Many thousand tags have accumulated at the state house—left over from the supplies of several years—and their bulk became so great that it was necessary to dispose of them. The lot weighs about 5 tons.

Makes Concrete Motor Bodies—Concrete motor cars are the latest invention of a French carriage maker. The concrete differs in its composition from that used for ordinary purposes by having a large percentage of cork substituted for gravel. The body is made by placing a metal form over a wooden trestle, with a small space between. A mixture, composed of plastic amalgam of concrete and the ground cork is poured into this space. The finished product is said to be even lighter than wood.

Wolf Hunting By Motor—Wolf hunting by motor car is a new pastime in Minnesota as a result of an accidental killing of a wolf by a motorist who was driving from Argyle to Warren after dark. F. J. Shreck, owner of the car, so easily was successful that the sport in the wolf country is bound to become popular where wolves are not desirable. The wolf came out of the brush a short distance ahead of the car. The electric headlight seemed to bewilder the beast so that it kept to the road. After a half-mile chase the car hit the wolf and bowled it over. Mr.

Schreck was traveling 45 miles an hour at the time.

Car and Family Ratio 1 to 6—The state of Kansas has passed the 70,000 mark in car registration, which, based on the commonwealth's population of 1,800,000, gives a machine for every twenty-six persons. Figuring on the basis of four to a family, the approximate ratio is one car to each six families.

Chauffeur's License for Mechanics—A test case will be made at Freeport, Ill., and the higher courts asked to decide whether or not mechanics employed in Illinois garages must take out a chauffeur's license. The state examiners, who have been visiting the principal cities of Illinois during the last 6 months, examining candidates for permits, insisted this year that all mechanics employed in the public garages take out licenses, the same as those who drive motor cars for hire.

Michigan Has State Dimmer Law—Headlights must be dimmed in Michigan after January 1. At that time the new general law will go into effect, and it contains a provision that headlights must be so equipped that they may be dimmed on certain occasions. When a machine is being operated in a city the lights must be dimmed practically all of the time. When operated in the country the lights must be dimmed when the machine approaches and passes a machine or other vehicle bound in the opposite direction.

May Change Washington Tax—If the recommendations of Men L. Price, Washington, D. C., tax collector, are adopted by congress, Washington motorists will have to pay an annual registration fee in lieu of the perpetual license fee of \$2 that now is exacted. In his annual report Price recommends that a license fee based on horsepower rating be charged and he suggests that the fees exacted by Maryland or Virginia be followed. If such a fee is charged it will take the place of the present personal tax fee that is charged in addition to a fee of \$2 that must be paid to secure a license number, such number being good as long as the person who takes it out owns the car.

If the car is sold at any time the license number becomes void and a new one must be secured.

Kansas Map Plan Squelched—The plan of J. T. Botkin, Kansas secretary of state, to use motor car license money for the publication of maps of the state and the free distribution of maps to holders of licenses, has been knocked in the head. S. B. Brewster, attorney general, has given his opinion that the license fund cannot be diverted to such a proposition.

Twin City Street Cars Dimmed—The dimmer ordinance of motor vehicles and street cars went into effect in Minneapolis, Minn., November 1. With an ordinance also in St. Paul, Twin City traffic is now on the same basis. It is left to the policeman in Minneapolis to determine whether the dimmer is sufficient under the ordinance in case he makes an arrest for violation of the dimmer act.

Car Repairing Extra Hazardous—Motor car repairing will be classed as extra hazardous occupation in the state of Washington after January 1, according to a resolution adopted by the industrial insurance commission, bringing all garages doing repair work under the compensation act at that date. Where men are employed in these shops it means that the owners must pay premiums into the insurance fund.

Charges Double Taxation—Brainerd, Minn., is in the midst of a fight against what is regarded double taxation for motor cars, state and local. Judge W. S. McClenahan of the district court has been asked to grant a temporary injunction against collection of wheel taxes. Four petitioners alleged that the ordinance is illegal because the city has no authority to regulate use of vehicles on the streets and the legislature has covered licensing of cars under general laws.

Pennsylvania's License Ruling—In conjunction with a notice sent out advising motorists to secure 1916 motor car licenses early, the motor vehicle division of the Pennsylvania state highway department warns that after the first of the year old licenses will be void. The department is preparing for a big rush.

Car Top Wireless Antennae—A report from Belgium tells of an extraordinary use of a motor car top, found by a British patrol that captured it from the Germans. Examination of the car revealed a wire connection to the skeleton of the raised top. Following the wire it was found to connect with a telephone receiver under the seat of the car. The Britisher held the receiver to his ear and could plainly hear a message coming from the nearest headquarters of the German army corps to which the captives belonged.

Arrest Iowa Drivers in Illinois—Wholesale arrests made in Rock Island, Ill., of chauffeurs employed by Davenport firms from across the river, who came to Rock Island to make delivery of goods, has aroused the Davenport firms affected. The same difficulty applies to chauffeurs who drive pleasure cars owned by Davenport men who cross the river to permit their employers to transact business in Illinois or to take a pleasure drive. Many also cross the river to trade with Rock Island merchants. The latter protest such arrests, as such action will have a tendency to keep trade away from Illinois merchants. The Illinois law requires all persons who drive a car for hire to take out a license fee, but does not stipulate

that drivers from other states temporarily within the limits of the state must take out a permit in accordance with the Illinois laws.

Massachusetts Motor Squadron—William T. Renwick, counsel for the Massachusetts State Automobile Association, has been given authority by Governor Walsh to form a motor squadron for the State militia. He has given the state a rapid firing gun, and he is now planning to get subscriptions to purchase four motor vehicles to form his squadron. Later on another one will be added for carrying food and baggage. The four vehicles making up the squadron will be equipped with rapid firing guns, and men interested in the militia and the motor industry will man them.

Drives Car at 82—Senator J. E. McComas, a pioneer who has lived in Pomona, Cal., since 1875, is an enthusiastic motorist at the age of 82 and he says he is afraid he soon will be so old that the state will refuse to grant him a license, just as a license is refused when an applicant is too young. The Senator is seen motorizing to his office every day and he is active in the business world. When McComas first came to Pomona, which is a dry town now, there was a saloon on the lot now occupied by the Main Street Garage. This saloon also was a general store and the postoffice was in the same building. The pioneer purchased the property for \$75, sold it for \$100, and saw it sell for \$13,000 cash, a short time ago.

Good Roads Activities

Campaign for Road Fund—With the object of building a hard surfaced road from North Bend, Wash., east through Coos county to connect with the Pacific highway, the Coos County Good Roads Association has inaugurated a campaign to raise \$370,000 to build the road.

Yellowstone Trail Meeting at Minneapolis—The next meeting of the Yellowstone Trail Association is to be in Minneapolis, Minn., in February. The executive committee at a recent meeting chose new members as follows: Dr. Floyd Tift, Colfax, Wash.; James V. Hawkins, Coeur d'Alene, Idaho; J. T. Brown, president of the Chicago Automobile club.

Pennsylvania Building Scientific Road—The Pennsylvania state highway department is building a concrete road on a sub-grade of Portland cement, 16 feet wide, from Allentown to Easton, via Bethlehem, along what is termed scientific lines. Modern machinery is being used and a force of several hundred men employed in the operation.

Club Works for Roads—The Southern Idaho Motor Association, which was organized less than a year ago at Boise, Ida., now has 1,000 members and a campaign is under way to bring the membership to 2,500 before the next session of the Idaho legislature. The objects of the association are to work for good roads and to promote the general welfare of the car owner.

Kansas City Wants Jackson Highway—E. E. Peake, secretary of the Kansas City Automobile Dealers' Association, has just returned from a visit to the section between Kansas City and Joplin along both suggested routes for the projected Jefferson highway. Mr. Peake's visit was for the purpose of arousing interest in the highway improvement and seeing that delegates were selected to the Jefferson highway convention which meets at New Orleans November 15 and 16, in favor of including Kansas City on the proposed highway. As between the two suggested routes for the road between Kansas City and Joplin, Mr. Peake says the motor organization of Kansas City is manifesting no preference. It is simply

trying to make sure that Kansas City is not missed.

Making Road Over Nisqually Hill—Work has been completed on the new road over the old Northern Pacific grade eliminating the dangerous Nisqually hill between Tacoma and Olympia. The grade on the new road does not exceed 2 per cent and all dangerous curves have been eliminated.

Organize to Build Road—The Blue Mountain Good Roads Association has been organized by representative business men of Walla Walla and Elgin, Wash., and the following officers elected: President, Paul H. Weyrauch; first vice-president, H. H. Weatherspoon; second vice-president, A. C. Miller; L. B. Tuttle, secretary and F. E. Smith, treasurer. This organization will build a road across the Blue Mountains through Wallowa, Umatilla and Union counties in Oregon, and Walla Walla and Columbia counties in Washington.

Reduce Toll Over Susquehanna—The Columbia Automobile Club, York and Lancaster, Pa., Chambers of Commerce, and motorists in general have won their fight against the Pennsylvania railroad relative to the reduction of the toll charges on the Columbia bridge, crossing the Susquehanna river between Columbia and Wrightsville. The railroad company has announced that the bridge toll has been reduced to 20 cents, which is one-half the former rate. The change will go into effect just as soon as the state public service commission passes on the new schedule submitted by the railroad company.

Maine Roads Under Patrol—The Maine state highway commission has decided to put all the state roads under a patrol system. Men will be stationed at various points and they will make daily tours over the stretch allotted to them and make any repairs necessary where the highway shows signs of breaking up. Paul D. Sargent, chief engineer of the commission, says that the proposed highway system under contemplation, covering 1,300 miles, will touch 238 cities and towns and serve 73 percent of the population of the state. This number of miles covers only 5 percent of the total mileage of the state.

\$3,000,000 for Minnesota Roads—The state of Minnesota will spend \$3,000,000 for better highways. To date this year the state has given counties for state aid \$750,000 for highways, which will be increased to \$1,500,000 before next January. George W. Cooley, engineer for the state highway commission, recommends a one-mill tax, and making the state's share of the expense for state roads one half. Mr. Cooley said: "The commission is engaged on a general plan of road construction and in training along parallel lines men who may be ex-

pected to take charge of the road system, and any change in the system would mean a different school for our engineers, conflict of methods and lack of harmony and unity. This would apply especially to construction of bridges which must, as a measure of economy, be as near possible of uniform design."

May Vote Road Bonds—There is available only \$233,000 in state road funds in Oregon for road work next year. The demand from various sections for state aid is so great that four times that amount could be used. There is pledged out of this fund approximately \$137,000 and, in addition \$25,000 is allotted for expenses of the state highway commission. Every county in Oregon wants better roads, and several counties are arranging to vote for special bond issues for road work.

Marking Roads—The Interstate Trail Association of Iowa has been interested by the Minnesota highway commission in marking interstate roads. The Minnesota organization will assist in marking a road by way of Austin, Minn.; Owatonna, Minn.; Faribault, Minn., to the Twin Cities from Iowa. The trail will be extended by linking up the state road to Duluth and Port Arthur, Minn. The Iowa association has also asked to have the road from the Twin Cities to the Itasca state park in northern Minnesota marked.

With the Motor Clubs

Club Marking Lincoln Highway—The Automobile Club of Philadelphia, Pa., has employed two men to place 2,000 signs on the Lincoln highway within a radius of 150 miles of Philadelphia. The signs are being put up at the rate of twenty-five a day.

Organize Club—Car owners of Pasco and Franklin county, Washington, at a well attended meeting held at Pasco, organized the Franklin County Automobile Club, with a large initial membership. H. H. Davis was elected president and Charles Johnson secretary-treasurer.

Thanksgiving Day Club Run—The Automobile Club of Southern California is to hold a club run from Los Angeles to San Diego on Thanksgiving to celebrate the completion of the new California state highway between Los Angeles and the southern exposition city over the coast route, the old El Camino Real. Plans are made for a Thanksgiving dinner at sunset in the heart of the exposition grounds.

Forms Motor Club—Thirty-three motorists have signed as charter members of the Brainerd Automobile Association, Brainerd, Minn. The organization will affiliate with the state and national associations. G. Roy Hill, secretary of the Minnesota State Automobile Association, installed the new officers who are: President, Dr. J. A. Rhazes; vice-president, C. W. Hoffman; treasurer, O. A. Peterson, and secretary, C. E. Hansing.

Club Offers Theft Rewards—To stop motor car thefts the Duluth Automobile Club, Duluth, Minn., officers have started a campaign, offering a reward of \$10 to any one furnishing information leading to the arrest and conviction of persons stealing cars marked "A. A. A." A similar amount will be paid where articles are stolen from cars, whether inside or outside a garage. An average of two machines a week have been stolen for several months.

Massachusetts A. A. Elects—The Massachusetts State Automobile Association held its annual meeting last week at which the officers, who have guided its work for some years, were re-elected as follows: Lewis R. Speare, president; John P. Coughlin, vice-president; James Fortesque, secretary-treasurer; William T. Benwick, counsel.

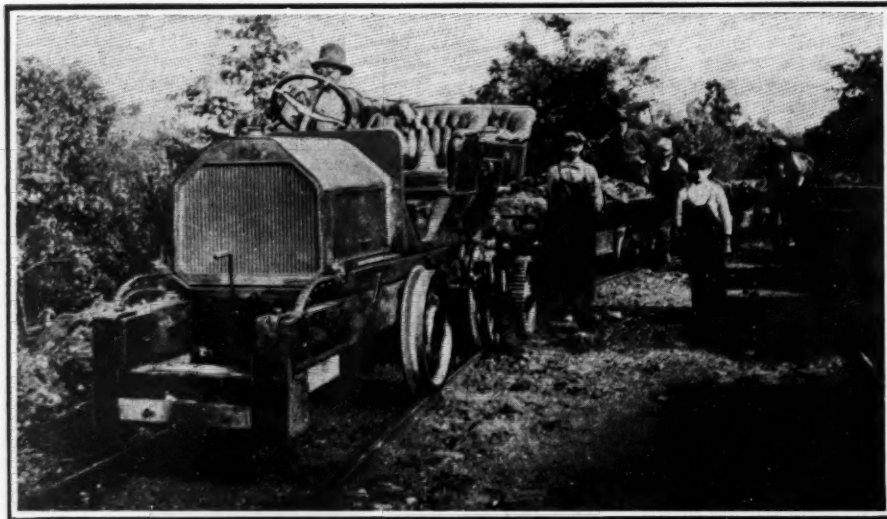
Coming Motor Events

SHOWS

November 12-20—Providence, R. I., show.
November 22-27—Binghamton, N. Y., show.
November 29-Dec. 4—Kansas City, Mo., electrical show.
January 1-8—New York show.
January 8-15—Cleveland show.
January 22-29—Chicago show.
January 29-February 5—Minneapolis show.
February 7-12—Kansas City, Mo., show.
February 14-19—Des Moines, Ia., show.
February 20-25—Grand Rapids, Mich., show.
February 21-27—Omaha, Neb., show.
February 21-26—Omaha, Neb., show.
February 29-March 4—Fort Dodge, Ia., show.
March 4-11—Boston show.



Among the Makers and Dealers



OVERLAND DOES MINING WORK—The above illustration shows an Overland touring car that after 5 years of service as a passenger vehicle, was converted by its owner into a mine motor for hauling cars in a coal mine at Brisbin, Pa. The owner found that this Overland took the place of a \$2,000 mine motor and it has given efficient service at its unique task. It is in constant use hauling cars from the mine to the coal breakers, with an average hauling capacity of fifteen filled cars per trip. The body, hood over the motor and steering wheel still remain unchanged, but the wheels have been replaced by others of a heavy, flanged-iron railroad type. The chassis has been fastened to a heavy framework of wood and iron, raising it several feet off the ground. The mechanical units, such as transmission and differential gears, still remain the same and the cost of making the change was very small.

PUBLISHER Now Piston Ring Maker—L. A. Stafford, formerly Chicago manager of the Chilton Co., publishers, of Philadelphia, Pa., has been made second vice-president of the McQuay Norris Mfg. Co., St. Louis, Mo.

Speedwell Equipment Bought—The Speedwell Auto Parts Co., Dayton, O., has purchased the patterns, jigs, tools, tracings and parts of the late Speedwell Motor Car Co., and is supplying parts for Speedwell cars and trucks since the close of the Speedwell plant.

Will Make Warner Traller—A. P. Warner, Beloit, Wis., one of the founders of the Warner Instrument Co., now the Beloit works of the Stewart-Warner Speedometer Corp., Chicago and Beloit, has developed a light traller truck for motor cars and is about to engage in the manufacture of the appliance on a large scale. The machine will be known as the Warner traller.

Federal Bridge Makes Tractors—The Federal Bridge Co., Waukesha, Wis., now is building tractors for several different companies, and each day the plant is the scene of a novel test. Two tractors with steering gear set, run for hours continuously, without the attention of a driver. In this way, the tractors are given a practical road test, and are examined at intervals only to see that they are working satisfactorily.

Success in Sale of Used Fords—"Scotty, the Ford Man," is the nick-name of Scott Sinclair, Detroit, Mich., who has made a reputation in that city as a dealer in used Ford cars. It is said that the day he started in business, he had not even \$2 to his credit, but with a good reputation and square dealing since March, 1915, when he started in business, to the end of last month, he sold very close to 400 used Ford cars. Now he has been appointed a dealer in new Ford cars by the Ford company and will open a

salesroom and garage in a new location, continuing his used car business in his present quarters.

Detroit Battery to Build—The Detroit Battery Co., Detroit, Mich., will build a three-story plant. Ground will be broken in a few days and the factory is to be ready for occupancy by January 1. The structure will be 70 by 100 feet. About 150 men will be employed.

Wichita Truck at Dallas—It is reported that J. G. Culbertson, manager of the Wichita Falls Motor Truck Co., Wichita Falls, Tex., has plans on foot for building a motor truck factory in Dallas. J. A. Kemp, president of the Wichita Falls Motor Truck Co., says that the plant of that company will not be moved from Wichita Falls, as has been currently reported. It is now filling some large war orders for motor trucks.

Will Make Steel Horses—The Steel Horse Co., Milwaukee, Wis., is the unique corporate style of a company organized in Milwaukee to manufacture a general utility gas tractor. The company is capitalized for \$25,000 and is backed by William B. Reith, Walter D. Mann and Adolph C. Graf. The tractor is designed especially for farm use and will haul a plow, cultivator, seeder, harrow of other light farm implements and can be used for light haulage of other kinds.

Organizes New Company—Andreas M. Soennichsen, well-known inventor and designer of motor car parts and accessories, who recently retired from the Auto Parts Mfg. Co., Milwaukee, Wis., has organized the A. M. S. Co. to engage in the manufacture of a line of newly patented articles for the motor car trade. A plant has been established in Milwaukee. The company is capitalized for \$10,000 and in addition to Mr. Soennichsen the incorporators are George W. Browne and Thomas C. McMillan,

of the Overland-Wisconsin Co., and George W. Browne, Automobiles, Inc., Milwaukee. The products will include shock absorbers, windshields, bumpers and fenders, etc.

Simms Magneto Enlarges—The Simms Magneto Co., East Orange, N. J., will build two additions to its plant, one to cost \$10,000 and the other \$5,000. Work will be started in the near future.

L. P. C. Employees Paid—All of the 280 mechanics employed by the L. P. C. Motor Co., Racine, Wis., which recently made an assignment in favor of creditors, have received their wages in full and obtained immediate employment in similar industries in Racine, Kenosha and neighboring cities where the demand for skilled help cannot be filled.

Luther Grinder Has Double Shift—The Luther Grinder Mfg. Co., Milwaukee, Wis., manufacturing an extensive line of tool grinders and similar appliances, now is operating double shift in most departments and at full capacity in others in order to cope with the demand from motor car and munition factories and jobbers and retailers in farm supplies. The company operates a large 6-story plant.

Gisholt Machine Takes New Quarters—The Gisholt Machine Co., Madison, Wis., turret lathes and other machine tools, has taken occupancy of the \$40,000 addition erected because the rush of business crowded the former quarters to the utmost limit of capacity. The new building affords 25,000 square feet of floor space. Approximately the same space has been added by the leasing of adjoining factory buildings recently vacated by the General Electric Co.

Will Make Accessories—Accessories will be made by the Ainsworth Mfg. Co., Detroit, Mich., which has been incorporated with a capital stock of \$100,000. The plant will locate temporarily in the building formerly occupied by the Ideal Mfg. Co. Clarence H. Booth, former general manager of the Studebaker Corp., is president of the company, and C. H. Ainsworth, secretary-treasurer. Mr. Ainsworth, the principal organizer, formerly was with the Rover Motor Car Co., Coventry, Eng., and more recently with the Rands Mfg. Co., Detroit.

Duty on Catalogs—Motor car and parts manufacturers who are sending catalogs and other advertising matter to Venezuela will benefit by the latest report from the United export bureau which states that if the matter is sent by parcel post it is subject to duty, whereas it is admitted free when sent by mail. When a firm in Venezuela is called upon to pay 40 to 50 cents, or more, as duty on the catalog of some American maker sent by parcel post, the usual result is that the catalog is refused and the maker in the United States wonders why his advertising in Venezuela brings little business.

Tire Makers Prosperous—Tire companies in this country are doing a large business. Heavy home sales of cars and the war's demands have brought about this prosperity. About 14,000 tires a day are being turned out by the B. F. Goodrich Co.; Goodyear is turning out about 10,000 and the United States Rubber Co. now is making 8,000, and this amount shortly will be increased to 10,000. The Kelly-Springfield Company will be producing about 1,500 tires a day by December 1. The company has purchased a new plant at Wooster to take care of its production. At Akron operations are con-

tinued on a 24-hour schedule and the company is so far behind its orders that capacity operations are certain on the same 24-hour schedule throughout the year.

Wycoff-Cord Assigns—The Wycoff-Cord Automobile Co., one of the largest motor concerns in Sioux City, Ia., has made a voluntary assignment to its creditors in the district court. The liabilities of the concern are \$100,000 and the statement of assets has not yet been filed.

Nordyke & Marmon Co. Adds—The Nordyke & Marmon Co., Indianapolis, Ind., has under construction a new steel and concrete building 375 feet long by 100 feet wide. This new building is located on a 21-acre plot adjoining the present factory site in West Indianapolis and is so located that it can be increased in length as more space is needed.

New Auburn Personnel—Besides the election of Morris Eckhart as president of the Auburn Automobile Co., Auburn, Ind., as mentioned in last week's Motor Age, the following is the personnel of officials of the Auburn company: F. E. Eckhart, first vice-president; J. I. Farley, second vice-president and sales manager; W. H. Denison, secretary and F. B. Sears, treasurer.

Fisk Building at Denver—The Fisk Rubber Co. is breaking ground for a new building at Denver, Colo. It will be 50 by 125 feet, one story and basement, and will cost \$25,000 to \$30,000. The main feature will be a service room large enough for 10 or 12 cars, which will furnish a big improvement over the crowded condition at its present Denver branch. The new building is expected ready for occupancy the first of the year.

Studebaker Adding Tuning Department—A three-story building, 50 by 350 feet, to be known as the tuning cars department, will be erected by the Studebaker Corp., Detroit, Mich., adjacent to its plant No. 3. It will cost about \$75,000. Other new structures are planned. Several now in course of construction soon will be ready for occupancy. The corporation reports that several hundred dollars were paid as premiums to advance delivery of the structural steel material.

Aluminum Goods Adding—The Aluminum Goods Mfg. Co., Manitowoc, Wis., which made important improvements and additions to its plant some time ago, has broken ground for another large factory addition and when this is completed will undertake the erection of a new warehouse and shipping room. The factory addition will be five stories high, 53 feet 6 inches by 300 feet, of brick and steel with mill floors. The investment in the addition will be approximately \$100,000.

Myers Goes Back to Stutz—William D. Myers, who was sales manager of the Stutz Motor Car Co., Indianapolis, Ind., and resigned a little over a year ago, has returned to his old position with the Stutz company. Mr. Myers left from the Stutz to organize the Myers-Ebersole Motor Co., Kansas City, Mo., which controls the agency for the Cole and Regal cars, and this business will be continued under the management of J. H. Ebersole, though Mr. Myers will retain his interest.

Developing New Heavy Duty Truck—The National Brake & Electric Co., Milwaukee, Wis., is engaged in the development of a new heavy duty motor truck of the gas-electric type, said to be particularly adapted for use on the war front. The company is part of the Westinghouse group. No information relative to the new product will be given out until development work is completed. The National company manufactures compressors, gasoline locomotive air brakes and electrical appliances and is the specialty plant of the Westinghouse com-

pany. Since July 1 the Milwaukee works force has been increased from 700 to 1,100 men.

Allen Adds to Factory—After having just recently built an addition to its motor factory at Bucyrus, O., the Allen Motor Car Co., Fostoria, O., is adding a special chassis assembly building at the main plant at Fostoria. An output for 1917 three times as large as that of 1916, and fifteen times as large as that of 1914 is anticipated.

Midgley Branch Managers Changed—R. L. Duffee, who has been manager of the New York branch of the Midgley Tire & Rubber Co., Lancaster, O., since the opening of the Gotham office some months ago, has been recalled to the home office, where his services are required in another capacity. Everett S. Benson now is manager of the New York branch.

Tire Companies Raise Wages—All of the Akron, O., tire and rubber factories have notified their machinists that beginning at once wages will be increased about 15 percent on the average. The wage increase is voluntary on the part of the rubber companies and will affect 2,500 men. In all about \$1,000 per day has been added to the payrolls of the factories by the increase.

New Willard Addition—The Willard Storage Battery Co. has added factory branches at San Francisco and Atlanta. The San Francisco branch has 15,000 feet of floor space and the Atlanta covers 6,000 feet of ground. The Chicago space is about to be doubled by the addition of 12,000 square feet of floor space and the 24,000 square feet to be ready about January 1 will be eight times as much as was occupied a year ago.

Maxwell Branch Managers Changed—C. L. Ackerson, recently manager of the Winnipeg, Man., branch of the Maxwell Motor Co., Detroit, Mich., has been transferred to Windsor, Ont., where he will make his headquarters and take over the duties of general sales manager for Canada. F. W. Wilkins, recently manager for Saskatchewan, has been transferred to Winnipeg and will have charge of sales in the western district.

Ford Has Fifty Branches—The fiftieth sales and service branch of the Ford Motor Co., Detroit, Mich., has been opened by the company in Yonkers, N. Y. Several others are being planned, but arrangements have not progressed to the point where a definite announcement can be made at this time.

Cadillac Produces 18,159 Eights—Since the Cadillac Motor Car Co., Detroit, Mich., shipped its first eight-cylinder, October 10, 1914, to October 23, 1915, the company has built and shipped 18,159 cars. During the year starting from the day the first eight was shipped to October 9, of this year, the number shipped was 17,255. The re-equipment of

the plant with new machinery and tools took much more time than had been anticipated and therefore production was greatly hampered for several months.

Anderson Leaves Stutz—Harry W. Anderson, sales manager for the Stutz Motor Car Co., Indianapolis, Ind., resigned November 1. He has not announced his plans, but will make his headquarters at the Hotel Astor, New York, for the present.

Standard Crucible Adds—The Standard Crucible Steel Casting Co., Milwaukee, Wis., will erect a foundry addition at once to keep the production commensurate with orders. The building will be 40 by 80 feet, brick and reinforced concrete. It is to be ready about December 1, at which time the foundry force will be increased by 30 to 35 men.

Buick Builds Foundry—The Buick Motor Co., Flint, Mich., has arranged for the construction of a new two-story foundry, 530 by 300 feet, to be made of concrete and steel. It will be one of the largest and best-equipped foundry buildings in the world and is expected to have a capacity of at least 200 tons of castings a day. Several hundred men will be added to the working force when the plant is completed, which is expected to be about May 1, 1916.

Changes in Case Personnel—Milton H. Pettit, formerly of Kenosha, Wis., was elected vice-president in charge of plants and production of the J. I. Case T. M. Co., Racine, Wis., succeeding F. Lee Norton, who resigned as vice-president and general manager of the Case company several months ago. Ellis J. Gittings, whose appointment as manager of the sales department was announced a few days ago, has also been elected a vice-president, in charge of sales. Richard T. Robinson, for many years secretary of the company, also resigned recently, as noted, and is succeeded by W. F. Sawyer, formerly manager of the sales department.



BOY Builds Unique Car—A small boy, an express wagon, a storage battery and a 1/10 horse power electric motor—put these together and you have a self-propelled vehicle that's the envy of every other boy in Fargo, N. D. Charles Olson, Jr., is the boy. His father conducts a Willard storage battery service station at Fargo, and gave his son a renovated Willard battery, type SLB-610. With this motive power the boy drives all around town, and often has four or five of his playmates hitch on behind, making a train of trailers. When the battery needs recharging he has daddy do it, and off he goes again on his juvenile joy-rides.

Recent Agencies Appointed by Motor Car Manufacturers

| Town | Firm | Supplies |
|-----------------|-----------------------|----------|
| Canton | F. A. Dunniway | Garage |
| Champaign | Charles B. Wiggins | Garage |
| Litchfield | Toedebusch | Garage |
| LaSalle | Art Krueger | Garage |
| INDIANA | | |
| South Bend | Borgerd & Steele | Garage |
| IOWA | | |
| Bagley | Oliver Mahler | Garage |
| Cascade | Martin Martinson | Garage |
| Cedar Rapids | J. A. Vikter & Son | Garage |
| Clio | H. H. Hughes | Garage |
| Lacey | Fred Cochran | Repair |
| Tipton | R. W. Phelps | Garage |
| Unionville | August Koehler | Garage |
| Waterloo | Waterloo Overland Co. | Garage |
| KENTUCKY | | |
| Cave City | H. Y. Davis | Garage |

| Town | Firm | Supplies |
|------------------|-------------------------|------------|
| Baltimore | Chrystal Ice | Garage |
| Baltimore | Globe Realty Co. | Garage |
| Baltimore | International Motor Co. | Garage |
| MINNESOTA | | |
| Geneva | O. R. Pickering | Garage |
| Northfield | H. A. Walker | Repairshop |
| Fairmont | W. & M. A. Crandall | Garage |
| Minneapolis | Minn. Motor Car Co. | Garage |
| MISSOURI | | |
| Clinton | Kendrick & Fath | Garage |
| MONTANA | | |
| Geraldine | Dick Brown | Garage |
| OHIO | | |
| Toledo | Superior Garage | Garage |

| Town | Firm | Supplies |
|---------------------|---------------------------------|----------|
| Harrisburg | D. A. Ryan | Garage |
| Philadelphia | Charles F. Sine | Garage |
| Philadelphia | Armstrong Estate | Garage |
| Philadelphia | Keystone Repair & Service Co. | Garage |
| Philadelphia | Stevens-Duryea Motors Parts Co. | Service |
| Vandergrift | M. E. Uncapher | Garage |
| SOUTH DAKOTA | | |
| Madison | Tom Smith | Garage |
| Canova | D. E. Countryman | Garage |
| WISCONSIN | | |
| Brodhead | Bert Stephens | Garage |
| Clinton | C. A. McCommons | Garage |
| Colfax | C. A. McKinney | Garage |
| Eagle River | Carter & Barkle | Garage |
| New Richmond | Schwallen Bros. | Garage |

New Garages, Repair Shops and Service Stations

| Town | Agent | Make |
|-----------------------------|-------------------------|----------|
| Phoenix | Badger & Meizer | Metz |
| DISTRICT OF COLUMBIA | | |
| Washington | Premier Sales Co. | Westcott |
| COLORADO | | |
| Ault | Carl & Kirkpatrick | Argo |
| Ault | Carl & Kirkpatrick | Briscoe |
| Ault | Carl & Kirkpatrick | Hollier |
| Boulder | S. D. Clark | Argo |
| Boulder | S. D. Clark | Briscoe |
| Cheyenne Wells | Overland Auto Sales Co. | Haynes |
| Cripple Creek | Evan Williams | Argo |
| Cripple Creek | Evan Williams | Briscoe |
| Cripple Creek | Evan Williams | Hollier |
| Denver | Geo. H. Estabrook | Argo |
| Fort Collins | Wolf & King | Briscoe |
| Fort Collins | Wolf & King | Hollier |
| Fort Collins | Wolf & King | Argo |
| Loveland | C. B. Henderson | Haynes |
| Paonia | A. I. Campbell | Argo |
| Paonia | A. I. Campbell | Briscoe |
| Platteville | Tedmond & Son | Argo |
| Platteville | Tedmond & Son | Briscoe |
| Platteville | Tedmond & Son | Hollier |
| Pueblo | Spitzer Bros. | Argo |

| Town | Agent | Make |
|-----------------|------------------------------|------------|
| Pueblo | Spitzer Bros. | Briscoe |
| Pueblo | Spitzer Bros. | Hollier |
| ILLINOIS | | |
| Alton | Alton Garage | Saxon |
| Alton | Alton Garage | Paige |
| Chenoa | Schneckenberger & Bauman | Dodge |
| Eldorado | C. C. Skelton | Saxon |
| Eldorado | C. C. Skelton | Paige |
| Freeport | A. H. Hartman | Grant |
| Jerseyville | Curnett & Shephard | Paige |
| Jerseyville | Curnett & Shephard | Saxon |
| Jacksonville | L. F. O'Donnell | Paige |
| Marshall | E. F. Clapp | Saxon |
| Marshall | E. F. Clapp | Paige |
| Minonk | Minonk Garage | Overland |
| St. Elmo | R. Kelley | Saxon |
| St. Elmo | R. Kelley | Paige |
| Woodstock | Mr. Sherburne | Jackson |
| Woodstock | J. E. Sherburne | Jackson |
| INDIANA | | |
| Evansville | Dixie Motors Co. | Oldsmobile |
| MICHIGAN | | |
| Battle Creek | Heyser-Finley Automobile Co. | |
| Port Huron | Beard, Campbell & Co. | Maxwell |
| Port Huron | Beard, Campbell & Co. | Saxon |

| Town | Agent | Make |
|---------------------|---------------------------|------------|
| Minneapolis | A. J. LaDuke | Westcott |
| MISSOURI | | |
| Illmo. | T. J. Elfert | Saxon |
| Illmo. | T. J. Elfert | Paige |
| Lixville | B. E. Rhyne | Paige |
| Lixville | B. E. Rhyne | Saxon |
| St. Louis | John Broadhead | Chevrolet |
| NEBRASKA | | |
| Sidney | Lincoln G. Simon | Oldsmobile |
| NEW YORK | | |
| Brooklyn | Westcott Automobile Co. | Westcott |
| New York | A. Elliott Ranney Co. | Daniels |
| Warwick | Warwick Auto Co. | Oldsmobile |
| PENNSYLVANIA | | |
| Philadelphia | Roche Brothers | Vellie |
| State College | C. E. Snyder | Dodge |
| TEXAS | | |
| El Paso | Nauman Motor Sales Co. | Reo |
| WASHINGTON | | |
| Seattle | Matthews Motor Car Co. | Jeffery |
| WISCONSIN | | |
| Green Bay | Thelen Garage Co. | Allen |
| Colfax | Paul & Rosenberg Auto Co. | Buick |
| Colfax | Paul & Rosenberg Auto Co. | Overland |

| Town | Agent | Make |
|--------------------|-------------------------|----------|
| Hot Springs | Phelps Auto Supply Co. | Vim |
| CALIFORNIA | | |
| Anaheim | Weisel & Co. | Bull |
| Compton | C. S. White | Bull |
| Imperial | J. R. Pease | Bull |
| Long Beach | A. J. Packmeyer | Bull |
| Los Alamitos | Hokker & Gardner | Bull |
| Owensmouth | J. L. Lodge | Bull |
| Pomona | Rancher's Mfg. Co. | Bull |
| Ventura | S. L. Martin | Bull |
| Freeport | Illinois Auto Sales Co. | Selden |
| COLORADO | | |
| Denver | W. A. Murphy | Detroit |
| CONNECTICUT | | |
| New Haven | Kirk's Garage | Vim |
| DELAWARE | | |
| Wilmington | Cabill & Co. | Brockway |
| ILLINOIS | | |
| Ottawa | N. A. Fruland | Vim |
| Streator | Solon Bros. | Vim |
| IOWA | | |
| Keokuk | W. E. Daniel | Vim |

| Town | Agent | Make |
|--------------------|--------------------------|----------|
| Topeka | Rehkopf Bros. | Vim |
| Wichita | Goodin Motor & Truck Co. | Vim |
| MAINE | | |
| Bingham | A. F. Denigan | Vim |
| MICHIGAN | | |
| Grand Rapids | E. C. Patton | Republic |
| MINNESOTA | | |
| Glenn | B. A. Goff | Vim |
| MISSISSIPPI | | |
| Jackson | Capital Auto Co. | Vim |
| NEW JERSEY | | |
| Cape May C. H. | Dix Auto Co. | Vim |
| New Brunswick | Enterprise Garage | Vim |
| Trenton | J. I. Peoples | Vim |
| NEW YORK | | |
| Binghamton | Binghamton Motor Car Co. | Vim |
| Yonkers | F. F. Dean | Vim |
| OHIO | | |
| Alliance | Alliance Motor Car Co. | Federal |
| Dayton | Durable Dayton Truck Co. | Vim |

| Town | Agent | Make |
|---------------------|----------------------------------|-------|
| Findlay | Castle's Garage | Vim |
| Mansfield | Richland Motor Car Co. | White |
| Youngstown | Vim Truck Sales Co. | Vim |
| OKLAHOMA | | |
| Oklahoma City | Kelly Motor Co. | Vim |
| PENNSYLVANIA | | |
| Allentown | Krause Auto Co. | Vim |
| Coatesville | J. J. Higgins | Vim |
| Hazleton | Hazleton Motor Truck Service Co. | Vim |
| Scranton | Samuel Weinberg | Vim |
| Sellersville | E. S. Jacoby & Son | Vim |
| RHODE ISLAND | | |
| Newport | Phillip F. Conroy | Vim |
| Providence | Paige Motor Co. | Vim |
| TEXAS | | |
| Dallas | W. T. Fulton Co. | Vim |
| VERMONT | | |
| Burlington | E. H. Russell | Vim |
| Randolph | Luther G. Kent | Vim |
| VIRGINIA | | |
| Richmond | R. A. Blenner | Vim |

Akron, O.—Giant Tire & Rubber Co., capital stock \$50,000; incorporator, John F. Schaefer.

Billings, Mont.—Midland Motor Co., capital stock \$40,000; incorporators, S. D. Macdonald, Rockwood Brown and B. H. Brown.

Black River Falls, Wis.—The Jackson County Auto Co., capital stock \$15,000, to deal in motor vehicles, operate garage, etc.; incorporators, J. H. Levis, Albert Knutson, H. H. Richards, Samuel Lund and H. M. Perry.

Center, S. D.—Auto Chain-Pull Co., capital stock \$50; incorporators, Ray E. Watson, D. F. Case and Fred C. Wix.

Chicago—Terry Automobile Lock Co., to manufacture and sell motor car appliances and accessories, capital stock \$10,000; incorporators, Samuel S. Terry, C. F. Schuster and L. S. Garden.

Chilhowie, Va.—Vance Motor Co., capital stock \$10,000; incorporators, James D. Tate, E. C. Cook, Q. A. Eller.

Cleveland, O.—Mason Tire & Rubber Co., capital stock \$250,000; incorporator, D. M. Mason.

Dover, Del.—Birch Motor College, to conduct schools in motoring, capital stock \$20,000; incorporators, H. M. Brown, M. E. Shakespeare and L. S. Dorsey.

Denver, Colo.—National Auto Signal & Mfg. Co., to manufacture motor car signals for street intersections, capital stock \$50,000; incorporators, Dr. C. V. Shoop, W. M. Moberly, Paul Absher, Walter E. Lupton.

Grand Rapids, Mich.—Wolverine Starter Co.,

Recent Incorporations

to manufacture starters and automobile parts, capital stock \$10,000.

Klemme, Ia.—Klemme Auto & Light Co., capital stock \$10,000; incorporators, A. G. Lau, H. J. Schlichting, William Katter, H. J. Stromer and H. R. Stromer.

Louisville, Ky.—Kentucky Tire & Rubber Works; incorporators, F. A. Jack, E. J. Bacon and E. W. Carter.

New York—Atlas Automobile Garage, capital stock \$9,000; incorporators, W. A. Merritt, A. R. Merritt.

Madison, Wis.—The Overland-Madison Co., capital stock \$10,000, to deal in motor vehicles, operate a garage, etc.; incorporators, R. A. Warner, Gustav Roe, J. P. Gillespie and Carl Roe.

Milwaukee, Wis.—The A. M. S. Co. of Milwaukee, capital stock \$10,000, to manufacture motor

car parts and accessories; incorporators, Andreas M. Soennichsen, George W. Browne and Thomas C. McMillan.

Milwaukee, Wis.—The Steel Horse Co. of Milwaukee, capital stock \$25,000, to manufacture and market gasoline tractors, machinery, etc.; incorporators, W. D. Mann, W. B. Reith and A. G. Graf.

New York—Consolidated Garage & Taxi Co., general garage and taxicab business, capital stock \$50,000; incorporators, F. Blen, Jr., E. P. Kilcoo, T. Adam.

Norfolk, Va.—E. L. Myers Sons, capital stock \$10,000; incorporators, H. S. Myers, E. L. Myers, N. C. Wright.

Springfield, Ill.—Imperial Garage Co.; incorporators, R. L. Conn, A. M. Weston and L. E. Vogel.

St. Louis, Mo.—Jenkins Vulcan Spring Co., capital stock \$40,000; incorporators, T. B. Jenkins, J. F. Jenkins, R. G. Zetrouer.

St. Louis, Mo.—Stitch-In-Time Garage & Repair Co., capital stock \$2,000; incorporators, E. H. Chesire, Catherine Gill, A. G. Eberle and L. J. Brooks, Jr.

Toledo, O.—Auto Repair & Machine Co., capital stock \$5,000; Mrs. C. A. Vandusen and others.

Toronto, Ont.—Canadian Tygard Engine Co., to manufacture engines, motors, etc., capital stock \$3,000,000.

Toronto, Ont.—Universal Appliance Mfg. Co., to manufacture motor cars, capital stock \$150,000.



KING EIGHT \$1150

Improved Five-Passenger Model

(Motor bore and stroke, 2 $\frac{7}{8}$ x 5)

IMMEDIATE DELIVERY

MORE power, numerous engine refinements, and finer body finish, make this car a superlative value. Only a greatly increased output permits the fixing of such a moderate price for a car of this quality. Thousands of these cars are now in successful operation the world over, and it was this model that made the famous official high gear tests on the Pacific Coast—two rough trips of over 800 miles each sealed in "high," both with perfect scores.

Remember, there are *more* KING EIGHT-CYLINDER cars in operation than any other make except one. The KING is the pioneer popular-priced eight—one year ahead of all competition, and this Company possesses a knowledge of Eight-Cylinder construction which makers in our wake can learn only through experience.

The new KING color is Salon green. Body and hood of that color, with black radiator, fenders and running boards. Wheels, black with gold stripe. A ride in this car will mark a new epoch in your motoring experience—and spoil you for other car types.

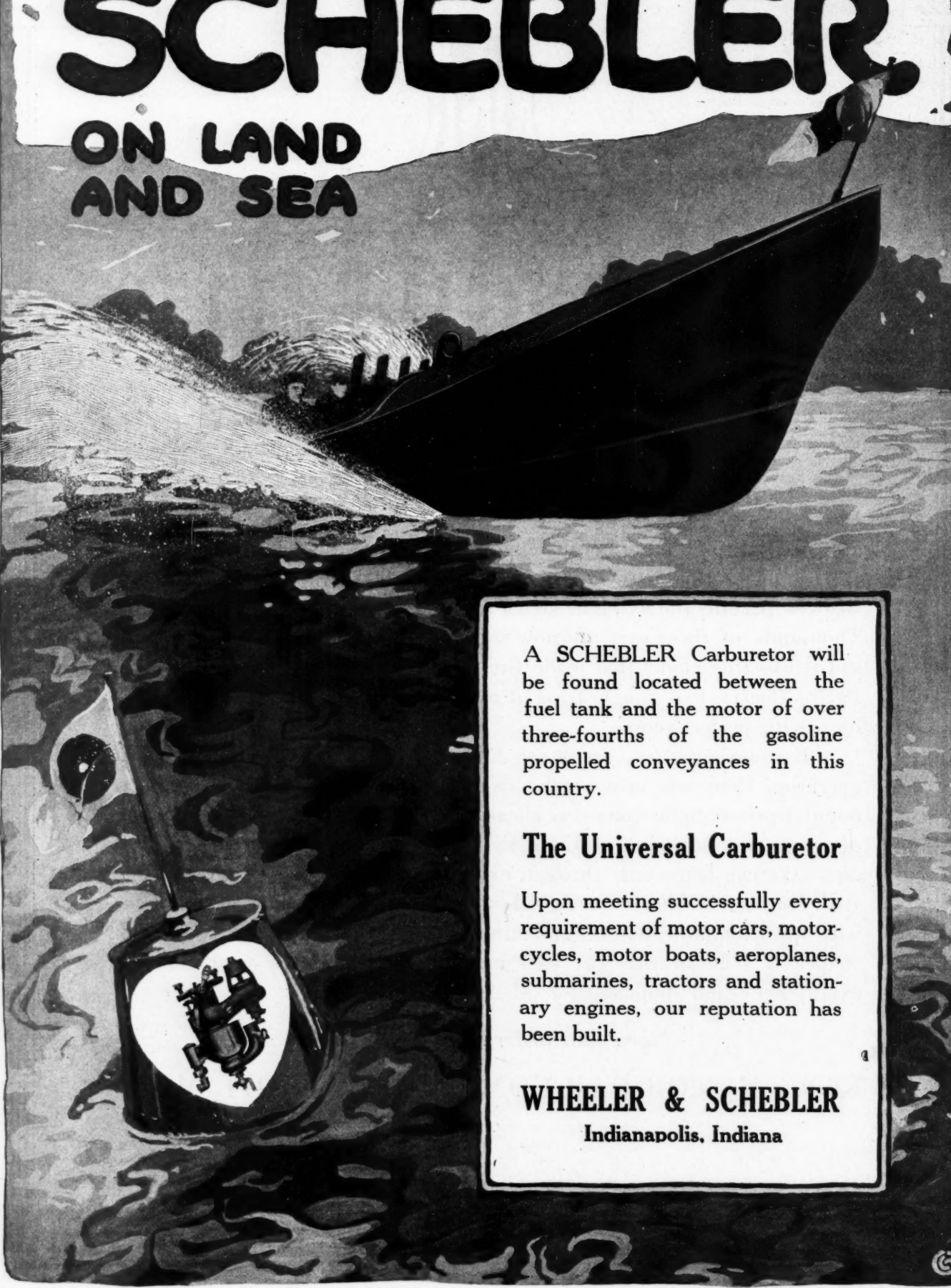
Place your order now. No waiting!

KING MOTOR CAR COMPANY, DETROIT, MICH.

DEALERS—The 1915 production of this Company is already double that of 1914, and this gain has been made on a new departure in automobile engineering—the successful EIGHT. At a price like \$1150, what will a car of the KING'S reputation mean to you in sales? There may be some open territory in your district. Wire!

SCHEBLER

**ON LAND
AND SEA**

A large, dark motor boat is shown from a side profile, moving across a body of water with visible ripples. In the foreground, a small, detailed illustration of a Schebler carburetor is shown, featuring a circular emblem with a mechanical design. The background consists of a dark, textured sky and a distant shoreline.

A SCHEBLER Carburetor will be found located between the fuel tank and the motor of over three-fourths of the gasoline propelled conveyances in this country.

The Universal Carburetor

Upon meeting successfully every requirement of motor cars, motor-cycles, motor boats, aeroplanes, submarines, tractors and stationary engines, our reputation has been built.

WHEELER & SCHEBLER

Indianapolis, Indiana

The Van Sicklen ... Speed Meter ...

ACCURATE REGISTRATION—

Adopted as
Standard Equipment
by
Hupp Motor Car Co.
Detroit.

¶ "The instrument is absolutely accurate, even at a speed under two miles an hour.

¶ "There isn't a variation of car speed that doesn't show on the speed dial instantly.

¶ "The action is so instantaneous that the speed-meter in its action is comparable to an accelerometer—an instrument used by experimental departments in testing the acceleration ability of a car."

*From Sept. 30, 1915, issue of
"THE SERVICE BULLETIN,"
the official house organ of the
Hupp Motor Car Co., Detroit,
Mich., for distribution among
Hupmobile Dealers and Owners.*

The VAN SICKLEN COMPANY

GENERAL OFFICES:
14 Chicago St., Elgin, Ill.

FACTORY:
Elgin National Watch Co.

Detroit Branch: 1255 Wood-
ward Ave., Detroit, Mich.

General Distributors: The
Beckley-Ralston Company,
Chicago

Eastern Distributors: A. J.
Picard & Co., 1722 Broad-
way, New York City

Foreign Distributors: Mestre
& Blatge, 20 Store St.,
Tottenham Ct. Rd. W. C.,
London, England

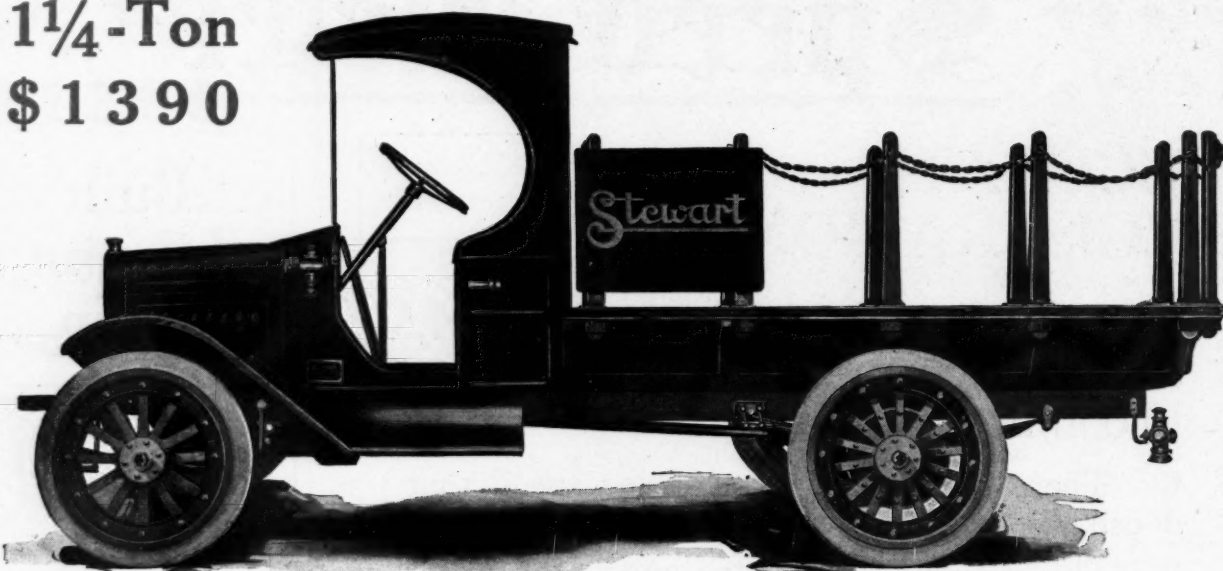


Built
Like an
Elgin
Watch—
by
Elgin
Watch
Makers

Flush type
with nickel
bezel. Price, \$25.00
Bracket type
for Fords, \$12.00

Stewart Quality Trucks

1 $\frac{1}{4}$ -Ton
\$ 1390



New Stewart Models—New Prices

Two new models with Stewart quality in every inch and pound of their construction—and offered at *startling new prices*—these make up the new Stewart line.

The new $\frac{3}{4}$ ton Stewart is priced at \$1290. Equipped with pneumatic tires; solid rubber tires optional.

The new $1\frac{1}{4}$ ton Stewart is priced at \$1390. Equipped with solid rubber tires; pneumatic tires optional.

In ninety lines of business in 137 cities—in the United States, Canada, South America—Stewart trucks are serving and saving for hundreds of owners—operating efficiently and economically—covering 25,000 to 30,000 miles without being overhauled—averaging only

\$1.50 per year for repair parts. With the addition of the $1\frac{1}{4}$ ton model, Stewart trucks can now serve the needs of even more lines of business. Bus operators, farmers, light carting concerns and many others will find this new $1\frac{1}{4}$ -ton Stewart ideal.

In every detail the new Stewart Quality Trucks embody absolutely the best practices in motor truck design. Every unit is of thoroughly high value. Better materials than Stewart Quality Trucks use cannot be obtained.

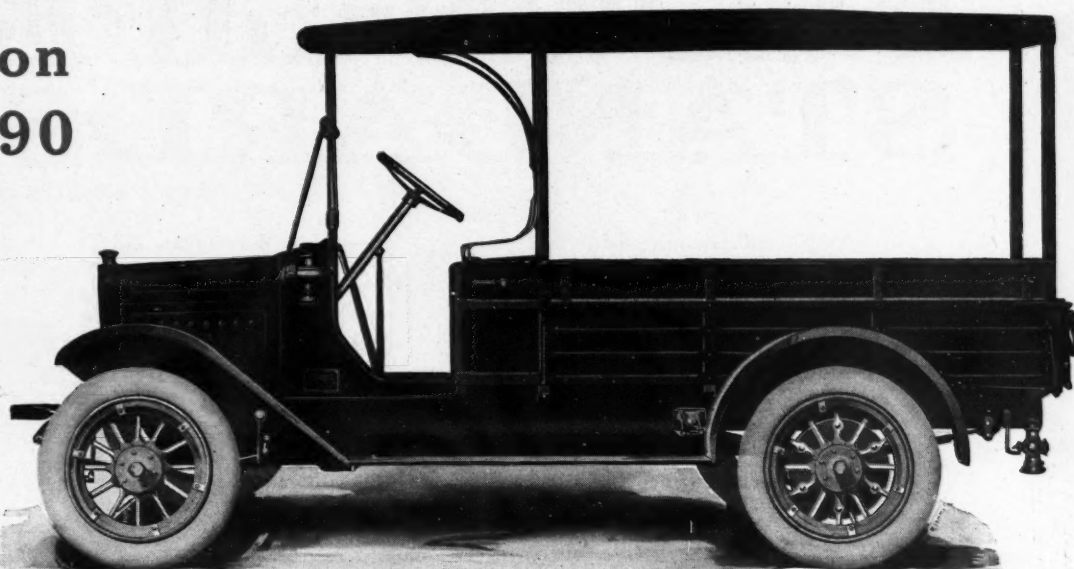
And then—remember that Stewart Trucks are built by a company that in three years has produced hundreds of quality trucks now in use by concerns of national prominence—such companies as the Bell Telephone Company, Coca Cola Company, and scores of other firms as well known. Furthermore, Stewart owners repeat—*buy more and more* Stewart Trucks all the time.

Write for descriptive literature with further information about the new Stewart Quality Trucks. *Do it now.*

Stewart Motor Corporation, Buffalo, New York

The Stewart Opportunity

$\frac{3}{4}$ -Ton
\$1290



Wanted—125 More Dealers— New Scale of Discounts

Never before have the money-making possibilities for dealers selling motor trucks been as big as they now are. Everything points to by far the greatest year in all motor truck history.

The truck industry really enters a new era. Builders of good trucks are going to become stronger. Live dealers are going to make a lot more money.

What are the signs, you ask? The warring nations, by using thousands of American trucks, are furnishing an object lesson to American merchants. The U. S. War and Postoffice Departments are giving up horses and using trucks. The price of horse flesh and horse feed has advanced. 35,000 horses a month are going out of this country.

Men in all lines of business are now convinced that the motor truck has come to stay.

Lower prices—bigger value—can only be possible in Stewart Quality Trucks by reason of greatly increased production. After three years of rapid growth and expansion the Stewart Motor Corporation now offers the best proposition to dealers, all things considered, that has ever been extended by any motor truck builder.

We need 125 more dealers at this time to take care of our widespread output. We want live, aggressive men who appreciate fully the wonderful future of the motor truck business and the opportunity offered by Stewart Quality Trucks.

To attract live, aggressive dealers we are willing to pay a premium—in the form of more liberal discounts than ever before.

The new Stewarts will prove fast sellers and money makers for you. Write us about territory. *Do it today.*

Stewart Motor Corporation, Buffalo, New York

(18)

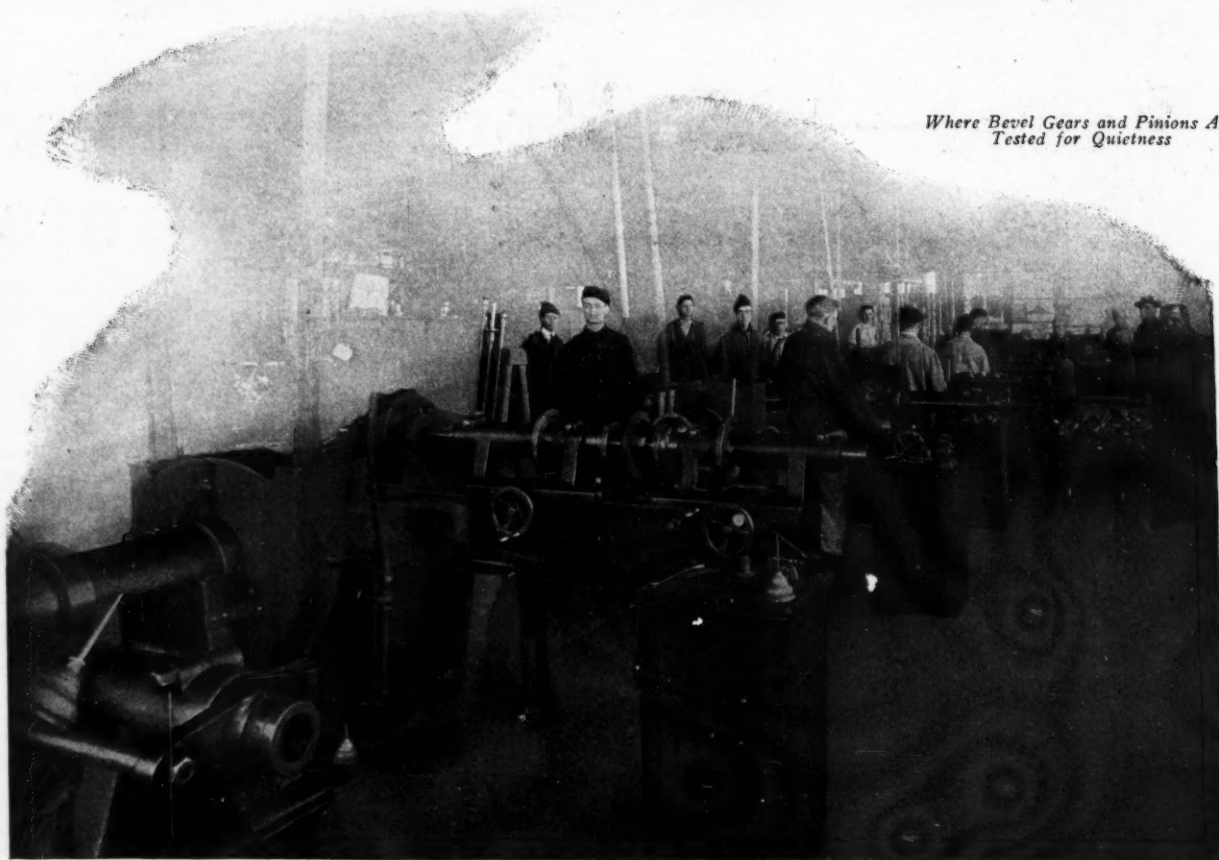
BROWN-LIPE STANDARDS

Notwithstanding the fact that the output of Brown-Lipe differentials and transmissions has practically been doubled during the past few months, there has been no let up in the severity of the inspection departments.

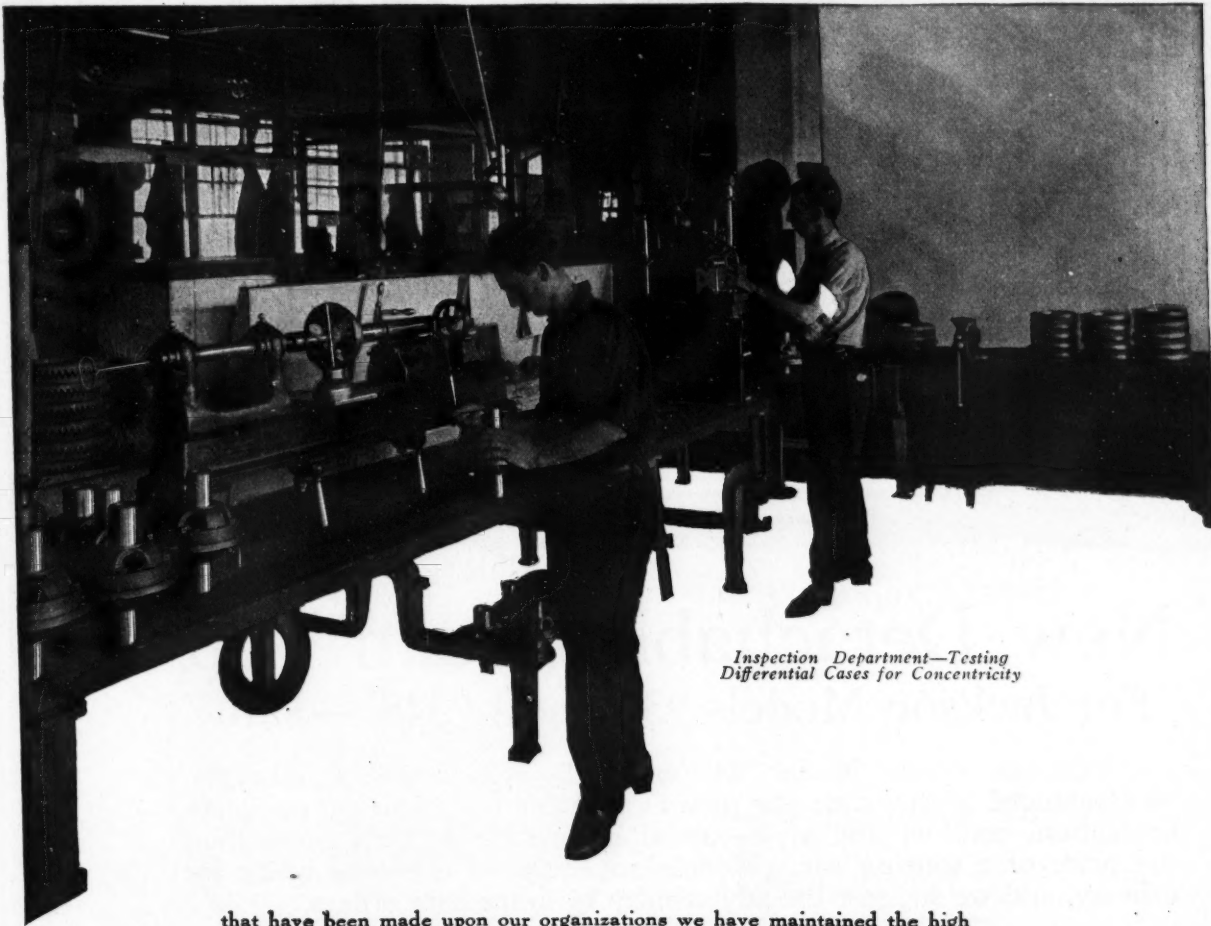
Every part of every assembly undergoes just the same rigid inspection to-day when our orders are far beyond our capacity as it would if we were running at half capacity.

This in spite of the fact that our output could be still further greatly increased if we were to let down to a scarcely noticeable extent in the severity of our inspection.

But we have clung steadfastly to our ideal of turning out only the finest quality products that could be produced, and there is a source of considerable satisfaction to us in the knowledge that in spite of the extraordinary demands



*Where Bevel Gears and Pinions Are
Tested for Quietness*



*Inspection Department—Testing
Differential Cases for Concentricity*

that have been made upon our organizations we have maintained the high quality of our output throughout and resisted the temptation to increase our shipping tonnage at the expense of the products themselves.

As we announced in a previous advertisement we will be unable to consider any further business before the first of the year, but we hope at that time to be able to accept some additional business with definite deliveries assured.

In this regard, however, one thing is certain—that the acceptance of any further business will be predicated entirely upon our ability to produce without any sacrifice of quality.

BROWN-LIPE GEAR CO.
TRANSMISSIONS

BROWN-LIPE-CHAPIN CO.
DIFFERENTIALS

SYRACUSE, NEW YORK

NEW YORK
Thos. J. Wetzel, 29 W. 42d St.

CHICAGO
K. Franklin Peterson, 122 So. Michigan Ave.



DETROIT
L. D. Bolton, 2215 Dime Savings Bank Bldg.

SAN FRANCISCO
A. H. Coates, 444 Market St.

Exhibiting Section 16, Transportation Building, Panama-Pacific Exposition, San Francisco



New Detachable Sedan Top For Jackson Models "34" and "348"—\$210

You can convert Model "34" or "348" Jackson into a luxurious, well-balanced Sedan with our new Detachable top. You get complete protection, comfort and style—an all-season car at little more than the price of a touring car. Models so equipped are **now ready for delivery**, and we suggest the advisability of immediate orders.

This beautiful Sedan top is interchangeable with the touring car top without any alterations of the body. It fits snugly and tightly around the windshield, and is fastened to the body by the regular top irons. It is substantially built and finely finished. It is worthy to become part of a Jackson car—and it is so firmly attached and so beautifully fitted, that it really does become part of the car.

Windows are crystal plate glass, can be raised or lowered easily, and are

fitted with anti-rattle devices. Gray whipcord lining. Electric dome lights. Heavily nicked fittings. Perfect ventilation. A really fine enclosed body—that satisfies from the standpoint of style as well as from the standpoint of comfort.

We offer this top at \$210. It is worth more than that for the added utility it gives your car. It permits a Sedan for winter—a touring car for summer use, and for the first time places this type of car within reach of the man who does not wish to maintain two machines, but desires a really aristocratic car for winter driving.

**Model "34" Four, with
Detachable Sedan Top**

\$1195

Motor $3\frac{1}{2}$ " x 5"; 112-inch wheelbase; 32" x 4" tires—fully equipped, including one-man touring top, electric lighting and starting system.

**Model "348" Eight, with
Detachable Sedan Top**

\$1405

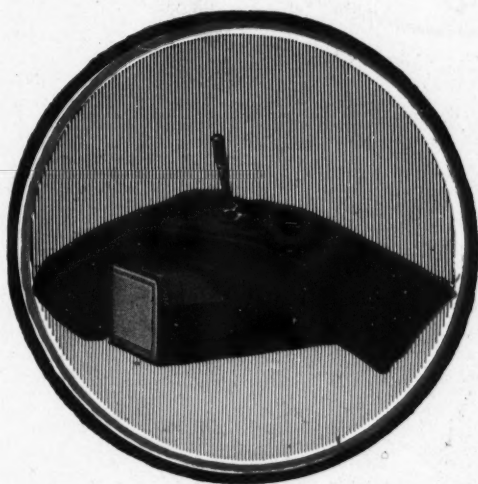
Motor $2\frac{7}{8}$ " x $4\frac{3}{4}$ "; 112-inch wheelbase; 32" x 4" tires—fully equipped, including one-man touring top, electric starting and lighting system.

We suggest early orders for early deliveries

JACKSON AUTOMOBILE COMPANY, 1207 EAST MAIN ST., JACKSON, MICHIGAN

Some Tube!

You Said It.



DEALERS: Write for details of exclusive territorial proposition on **NATIONAL SPECIAL 5000-MILE TIRES and TUBES.** Lower list than on similar quality goods, profitable discounts, protected territory. Address Sales Department.

National
SPECIAL
RED TUBE

- Pure Gum!
- Antimony Cured!
- Built by Hand!
- Almighty Thick!
- Everlastingly Tough!
- Laminated!
- Specially Guaranteed!
- “Some Tube” is Right!

National Rubber Company

Factory and Main Offices:

Pottstown Pa.

DISTRIBUTORS:

LOUISIANA
Lake Charles Auto & Supply Co.,
Lake Charles

IOWA
Marshall Oil Co.,
Marshalltown

PENNSYLVANIA
J. M. Shock Absorber & Auto Spec. Co.,
Pittsburgh
J. M. Shock Absorber Co.,
Philadelphia

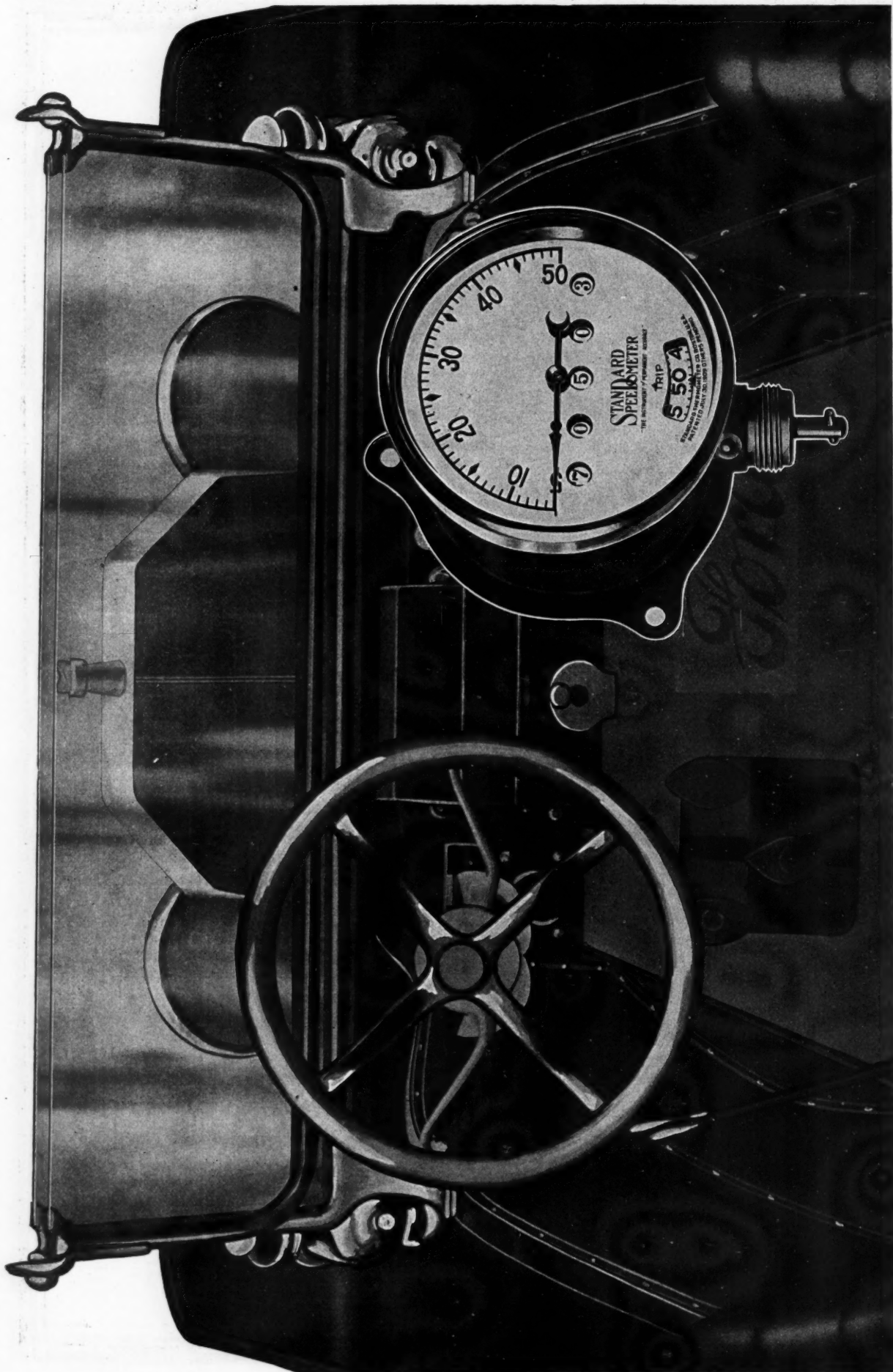
VIRGINIA
Graves-Humphreys Hdw. Co.,
Roanoke

MISSOURI
Marshall Oil Co.,
Kansas City

MINNESOTA
Marshall Oil Co.,
Minneapolis

TEXAS
Tennison Bros.,
Dallas

NEW YORK
J. M. Shock Absorber Co.,
New York City
C. A. Carlson,
700 Main, Buffalo



Standard Speedometers for

When Writing to Advertisers, Please Mention Motor Age

America's Standard Car

Here is the logical Speedometer equipment for the Ford car—the Speedometer in which the Ford principles of great accuracy, sturdy construction, quantity production and reasonable price are carried to their highest development.

You can pay more money for a speedometer—yes. But you can't possibly get more speedometer no matter what you pay, than we offer you in the Standard.

To Ford Dealers

Probably no car on the market gets such abuse as the Ford. And its success has been due to its ability to keep running, day in and day out, on mountain trails as well as boulevards.

In the Standard we offer you a speedometer equipment that is as trustworthy as the car you sell. From the fiber pinion on the driving joint, all the way to the tip of the indicating hand, it's built right—not down to a price, but up to the Ford standard.

"Service," in the motor car world, is a

\$12

Write your Nearest
Branch, or Ourselves
for Discounts: They
Mean Profit to You.

Concerning Service

badly overworked word. Those of you whose experience of "Service" causes you to think of a small job at a big price, should investigate Standard Service. Each of our 50 factory branches is equipped with an outfit of calibrating instruments and complete facilities for the adjustment and repair of Standard Speedometers, in the hands of men who are not merely repair men but standard speedometer experts.

It's their work to keep Standard speedometers in proper order. Whenever any fault in operation is chargeable to the instrument itself, it is made right, without cost to the customer—if not the fault of the instrument, a small charge is made to cover actual cost of work. This is service—not the letter of the word only, but the spirit also.

Your Opportunity

to sell a speedometer with every Ford car that passes through your hands, will never be better. The Standard is the speedometer you should handle—used as standard equipment on Ford cars last year, it is in every way best adapted for Ford equipment right now. Moreover, it is backed by Standard Service which knows no equal.

Send the Coupon

and get the details of our broad-gauge selling plan. It's calculated to bring us more business of course; but it must first make it profitable for you to handle Standard Speedometers. We stand ready at all times to co-operate with you to any extent within reason. The coupon—now.

Standard Thermometer Co., Boston, Mass.
Gentlemen:—Please send to me by return mail, details of your selling plan and complete descriptive matter regarding Standard Speedometers for Ford cars.
Name.....
Address.....
M.A.

Standard Thermometer Co., Boston, Mass.

Trade Discounts



A New Schedule of
Trade Prices
on the

MOSLER VESUVIUS PLUG

has been fixed.

It means greater and better profits for the dealer. The plug itself has been simplified and improved.

It has the same indestructible "Vtite" (stone) insulation that made it famous.

It has the same knife-edge sparking points that give extra power.

It is made any size—any thread so that it fits any motor.

It has no equal for power and speed—and—

It is guaranteed for the life of the motor.

The price remains the same,

\$1.00

Get your discount schedule today. It is fixed—the same to dealers the world over. Get it—because it opens the way to greater profits.

A. R. MOSLER & COMPANY
NEW YORK, N. Y.

When Writing to Advertisers, Please Mention Motor Age

This is
THE EIGHT
WITH THE
NEW LIGHTNESS



Oldsmobile

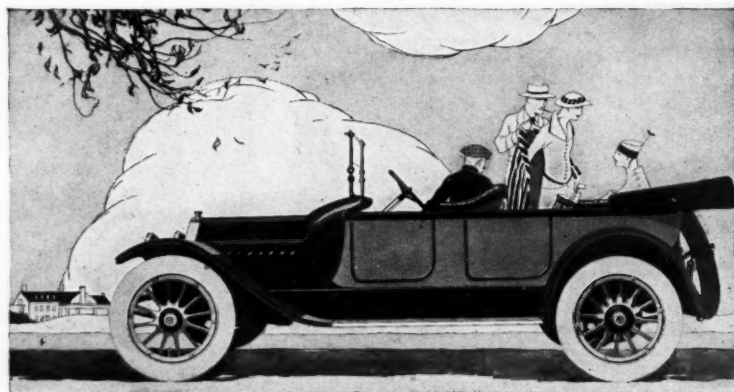
THE power, speed and quick response you have asked for, combined for the first time in a multi-cylinder automobile weighing less than 2700 pounds. TYPE 44—Wheel-base, 120 inches. Price, f. o. b. Factory, \$1295.

Established
1880

OLDS MOTOR WORKS
Lansing, Michigan

Incorporated
1899

OLDSMOBILE FOUR TYPE 43



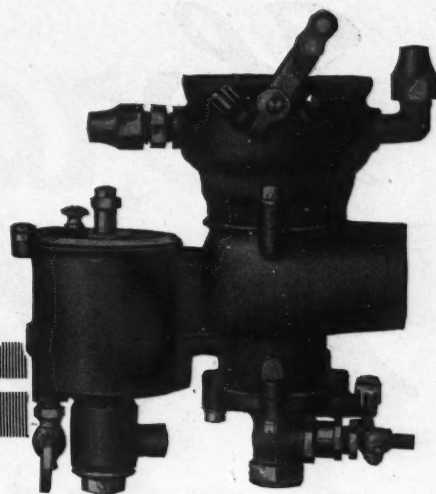
OLDSMOBILE FOUR—TYPE 43

WITH production the largest in seventeen years, the resources of our factory have been taxed to satisfy the thousands who desire a high-grade four-cylinder motor in a light car chassis. *Price, f. o. b. Factory, \$1095.*

OLDS MOTOR WORKS
LANSING, MICHIGAN



Easy Starting



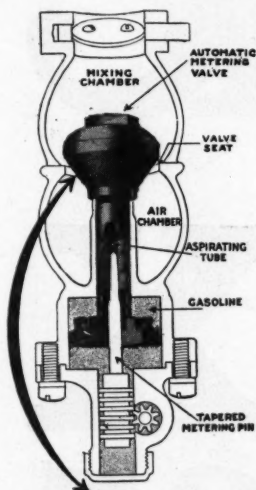
How to obtain easy starting with a cold motor and when using heavy gasoline has long been a serious question with carburetor manufacturers and designers.

Hard starting in so far as carburetion is concerned is due to the difficulty in properly vaporizing gasoline which is now prevalent on the market. The colder the motor the greater is the difficulty encountered.

To overcome this trouble—to obtain easy starting under adverse conditions—requires a carburetor designed to give an increased flow of gasoline, sufficient to compensate for the losses incurred through the use of gasoline that does not vaporize readily.

And maximum starting efficiency will only result where this increased gasoline flow is also thoroughly atomized.

STEWART CARBURETOR



THE AUTOMATIC METERING VALVE

This valve is controlled by gravity and the motor's suction—no springs or complicated mechanism. The motor's suction lifts the Metering Valve from the Valve Seat, admitting air to mixing chamber and at the same time drawing gasoline up through the Aspirating Tube. Briefly, the TOP of the valve measures the air and the BOTTOM measures the gasoline with the result that the correct mixture is always automatically maintained.

With the Stewart you can get a mixture in the right proportion for starting even at the lowest speeds.

And the mixture will be thoroughly atomized because the Automatic Metering Valve is so designed that a certain portion of the air always enters the Mixing Chamber at a very high velocity.

This in-rushing air picks the gasoline from the end of the Aspirating Tube, atomizing it thoroughly and supplying the motor with a most powerful explosive mixture.

It is because of its easy starting qualities and the absolute absence of delicate and intricate adjustment that the Stewart Carburetor gives the most consistent service in the hands of the

average automobile owner under ordinary, everyday conditions.

If you are encountering any starting difficulties due to poor carburetion we would suggest that you send for our new catalog—it explains and illustrates these easy starting features in detail and incidentally contains much interesting and helpful information in regard to perfect carburetion.

A request for catalog A5 will bring a copy to your address.

Dealers—The Stewart Carburetor, because of its extreme simplicity, makes an ideal instrument for the retail trade. It offers a wonderful opportunity for the right dealer in your locality. Send for our dealer's proposition.

DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A.

CANADIAN DETROIT LUBRICATOR COMPANY LTD.

WILKINSVILLE, ONTARIO.

One of the World's Largest Makers of Engineering Specialties



When Writing to Advertisers, Please Mention Motor Age

*Here's a car
that sells by
comparison:*

Velie
Model 22 Six
\$1065

VELIE FEATURES

115-inch wheel base—standard tread
Velie Continental motor 40 h. p.
Removable cylinder head for inspection
Helical gears in motor—no chains
Multiple dry disc clutch
Automatic ignition system
Hotchkiss type of drive
No noisy strut rods or torque arm
Spiral gears in rear axle
48-inch underslung rear springs
Velie-Stewart vacuum feed
All electric wiring in metal conduits
Push button starting device
Two-unit Remy electric system
Expanding tire iron—no straps
Velie mirror finish 20 operations deep
Fine leather deep tufted upholstery
Double-bulb headlights—rigid supports
Curved radiator blending with hood and body
Windshield ventilating top and bottom
15-gallon gasoline tank with gauge at rear
Simple rocking gear shift lever
Quick adjustable side curtains
Heavy steel-crowned fenders
Cowl light shows if tail light is going

EQUIPMENT

One-man top, speedometer, dash light, portable light, coat rail, foot rail, electric horn under hood, 32x4 in. tires front and rear (non-skids on rear), 5 single-piece demountable rims and full tool equipment, tool kit, etc.

See the Car—See Also

Model 15—5 Passenger—\$1400

Model 15—6 Passenger—\$1450

Write or Wire for Dealer Proposition Today

Velie Motor Vehicle Co., 113 Velie Place, Moline, Ill.

When Writing to Advertisers, Please Mention Motor Age



RESTA



BURMAN

ALL SIX USED THE FAMOUS ZENITH CARBURETOR

In the race of races—the blue ribbon classic for the season's winners—at Sheepshead Bay, N. Y., on Nov. 2nd all six cars entered used the carburetor of maximum results. This was the culminating Zenith victory for 1915 and Resta's speed of over 105 miles per hour proved the wisdom of their choice.

ZENITH CARBURETOR CO.
DETROIT, MICHIGAN



RICKENBACHER



DE PALMA

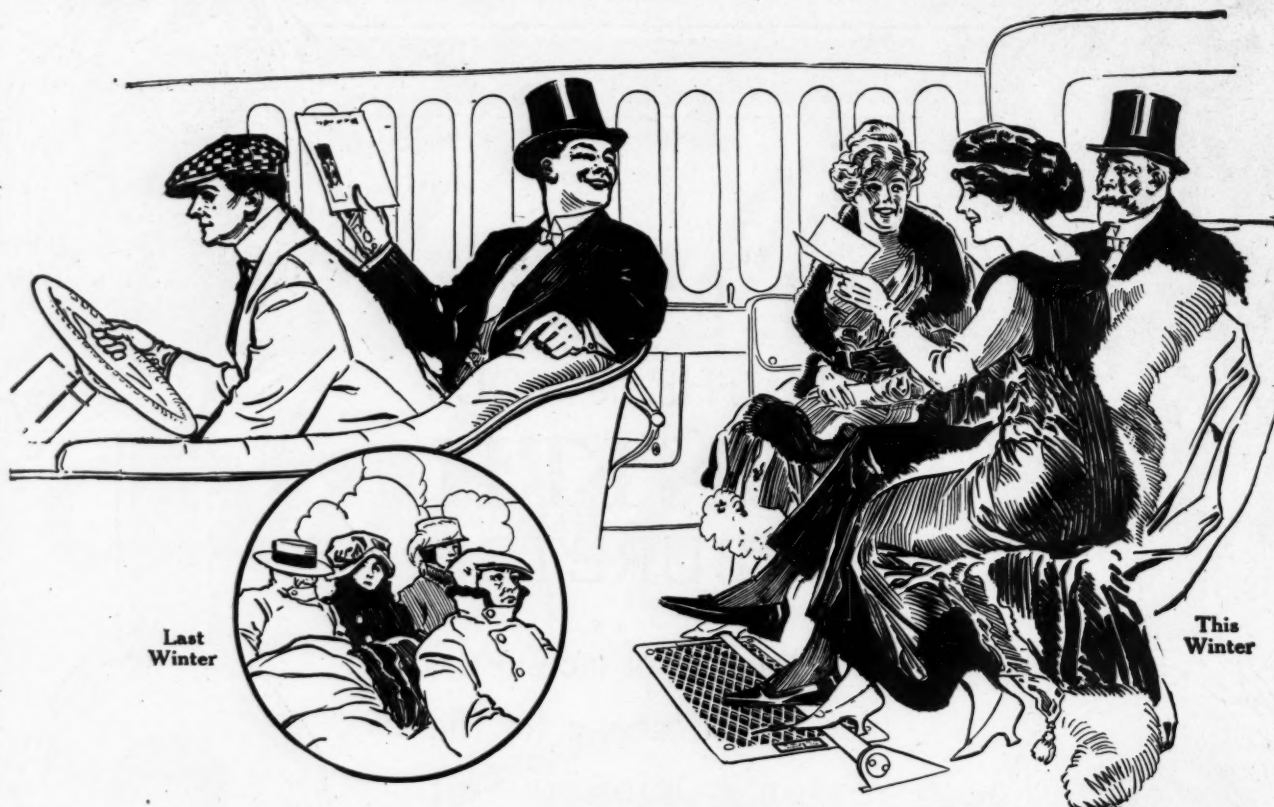


AITKEN



MULFORD

When Writing to Advertisers, Please Mention Motor Age



Real Winter Business For Dealers

Thousands of motorists who would like to use their cars during cold weather feel that they cannot afford limousine or winter tops.

Until the advent of

The Perfection Heater

PATENTED

it was necessary to have an enclosed body if you wanted any degree of driving comfort.

At a small cost for installation and *absolutely*

no Operating Cost

the Perfection Heater makes winter driving really practical and comfortable in any car with ordinary top and snug fitting side curtains.

You not only get the profit on the sale of the Perfection Heater itself, but installation work keeps things moving in your shop.

And winter driving means the regular run of business for you all winter.

The Perfection Heater is a live money-making proposition. It brings business when you need it most.

Write today for full information and descriptive booklet.

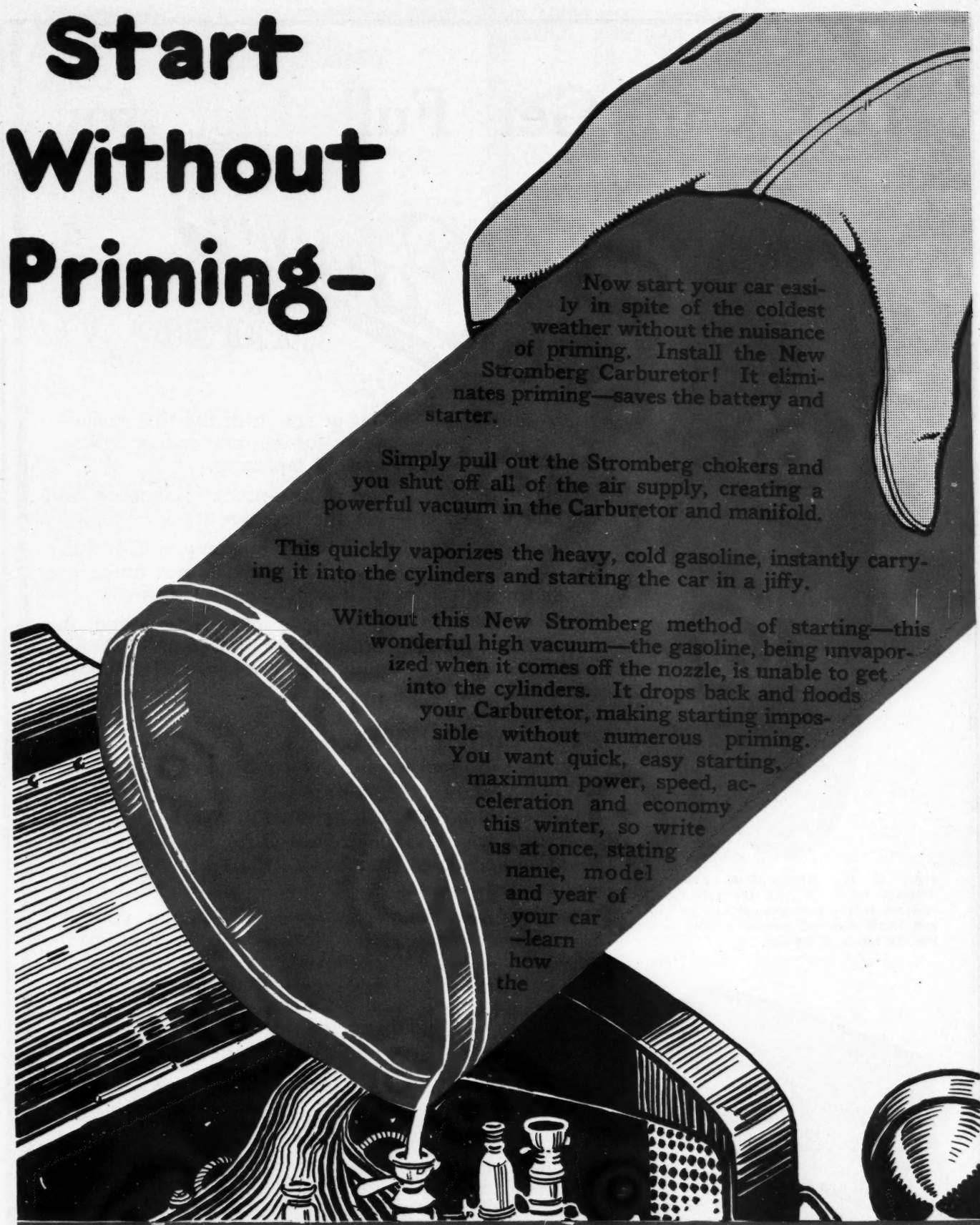
The Perfection-Spring Service Co.

2002 E. 65th Street

Cleveland, Ohio

New York Service Branch 610-16 W. 65th Street

Start Without Priming—



Now start your car easily in spite of the coldest weather without the nuisance of priming. Install the New Stromberg Carburetor! It eliminates priming—saves the battery and starter.

Simply pull out the Stromberg chokers and you shut off all of the air supply, creating a powerful vacuum in the Carburetor and manifold.

This quickly vaporizes the heavy, cold gasoline, instantly carrying it into the cylinders and starting the car in a jiffy.

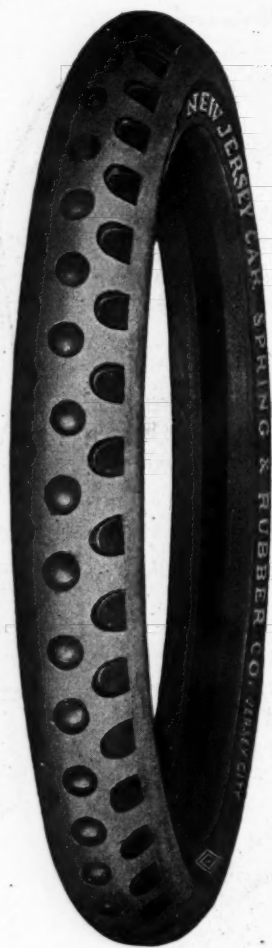
Without this New Stromberg method of starting—this wonderful high vacuum—the gasoline, being unvaporized when it comes off the nozzle, is unable to get into the cylinders. It drops back and floods your Carburetor, making starting impossible without numerous priming.

You want quick, easy starting, maximum power, speed, acceleration and economy this winter, so write us at once, stating name, model and year of your car—learn how the

New STROMBERG Does it! CARBURETOR

Stromberg Motor Devices Co., Dept. G—64 E. 25th St., Chicago

You Can Get Full List for



Here is the CARSPRING ANTI-SKID TREAD—the kind with the raised-center, vacuum cups which grip and let go in the scientifically correct manner without retarding the speed of the car.



CARSPRING TUBES are worthy of use with CARSPRING TIRES. Made of several laminations of live rubber, they have the strength to resist blowouts and other trouble breeders.

Carspring BEST UNDER A CAR—BEST ON EARTH Tires

Right now there is a lot of action in the tire business. Owners are getting ready for fall and winter driving, the summer used tires need replacing.

Action, however, is one thing—profit is another, and we talk to Dealers—via the profit route.

You can get a lot of action with most any kind of a tire but unless you make a profit there is not much use going through a lot of lost motion.

CARSPRING TIRES produce immediate action, for the demand for high grade tires of Carspring quality is greater than the supply. In the last twelve months our production has increased over 300% to supply waiting buyers.

CARSPRING TIRES bring you a legitimate profit. You can sell them for full list—and they will repeat at full list, year in—year out.

CARSPRING TIRES sell for full list because they look their price and they repeat at full list because they stand up and give better service than people have been accustomed to getting.

What we have told you about the action you get handling CARSPRING TIRES—about the profits you make selling CARSPRING TIRES—is backed up and strengthened by our policy of selling through the Trade exclusively—one good dealer to each territory. If there is no CARSPRING Dealer in your territory, and you can measure up to specifications,

CARSPRING Quality—
CARSPRING Service—and
CARSPRING Cooperation

will establish your tire department on a permanent and profitable basis.

New Jersey Car Spring & Rubber Co. Jersey City, N. J.



FORD

Today's Opportunity in the Ford Business

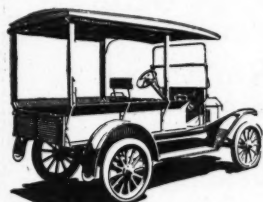
The Ford is the logical car for light delivery. Merchants and business men have thousands and thousands of dollars to pay to Ford Dealers for Commercial Cars—but they have got to be shown.

BABCOCK BODIES

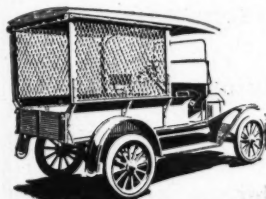
for Ford Commercial Cars



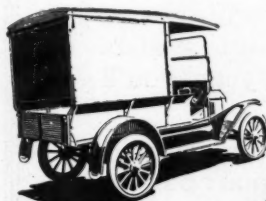
Light Express



Express with Top
and Curtains



Express with Top Curtains
and Heavy Wire Screen
Sides



Steel Side—Panel
Delivery

are the answer. Babcock is in the business in earnest and he is going about it on the Ford idea which, as you know, is a good design with quantity back of it. This means high quality at the lowest possible price.

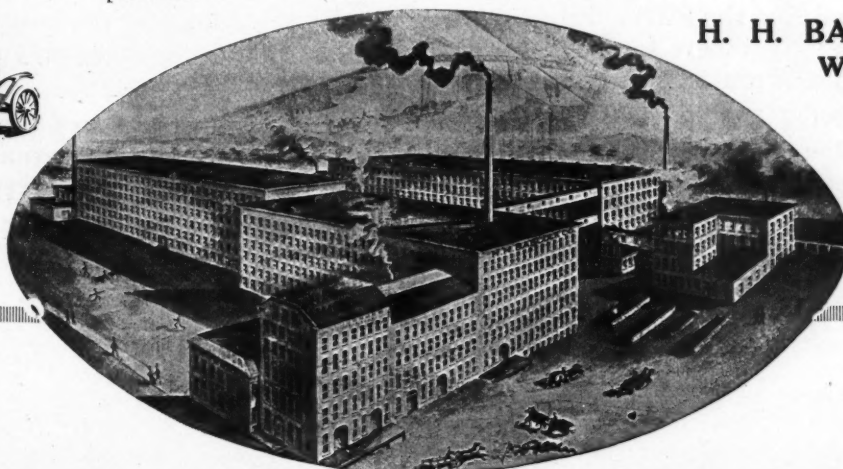
Babcock builds on the unit plan in thousand lots. Eight different types to fit every requirement in business; but produced in such a way that each body gets the benefit of the quantity production.

These bodies are the most substantial and serviceable bodies you can buy and yet they are the lightest. Back of each body stands the name of Babcock, famous for 70 years all over the world for quality carriage building.

Ford Dealers are used to the support of a big powerful organization back of every car. Here is one back of the bodies.

Babcock bodies are sold only through distributors and Ford Dealers, but every one interested in delivery wagons is invited to send for booklet giving full illustrations, descriptions and prices.

H. H. BABCOCK CO.
Watertown, N. Y.



When Writing to Advertisers, Please Mention Motor Age

The New **REO** *the Fifth* *The Incomparable Four*



Ideal—From the Dealer's Standpoint

REO DEALERS TELL US that Reo the Fifth is the most satisfactory car to handle they have ever known.

AND DEALERS WHO HAVE in the past handled lines other than Reo tell us it is a revelation to them how this car stands up in performance, and how cheap is the cost of making good every sales-promise.

THE OWNER-BOOSTER is, after all, the biggest factor in merchandising.

THE BEST ADVERTISING can sell a car—but to stay sold it must prove a good car.

THIS MUST BE a mighty good car to back up the claims and the promises we make for Reo the Fifth.

"THE BREAD WINNER," one Reo dealer calls it, and another laughingly terms it "Old Net Profit."

AND REO THE FIFTH is just that—mostly all net profit to the dealer.

PRICE \$875 for this model constitutes the greatest value ever offered in an automobile—a price made possible only by the fact that we have made this model for five years with only slight refinements from year to year.

WHEN YOU CONSIDER the value represented you'll understand why it is so easy to sell Reo the Fifth, and when you consider that last year the cost to dealers of keeping customers satisfied was less than six dollars per car per year, you'll realize that it must be some satisfaction to handle such a car.

WE ARE NOT LOOKING for more Reo dealers just now save in a few isolated points where we are not fully satisfied with our present representation; but we like to keep in touch with the Live Ones, and we suggest that you keep your eye on Reo. You'll note that it is the most profitable line.

AND SOME DAY—who can tell?

Reo Motor Car Company
Lansing, Michigan, U. S. A.

No. 102

They try to "Get By"

ONE of the greatest assurances of the quality of Stewart Products is the wide extent to which they are always advertised.

The big advertiser is always a responsible concern to do business with.

He invests big money in the business. He has to live up to his reputation. He can't afford to put anything over. He must make good, in his products, on every statement made in his advertising. *Others try to "get by."*

Buy the well known advertised products in every line and you take no chances. The manufacturers of standard well known brands always make good.

The dealers who carry standard well known advertised products are bound to be the live progressive concerns and are sure to carry the very highest quality—and latest products on the market.



\$7⁵⁰

Price includes bracket, also 10 feet of wire, and an entirely new style of **BIG MUSHROOM BUTTON**, which you can strike with your whole hand, arm, elbow or finger without having to feel for it.

**Stewart Motor-driven
Warning Signal**

"The Aristocrat of Signals"

Stewart-Warner Speedometer Corporation, Chicago, U. S. A.

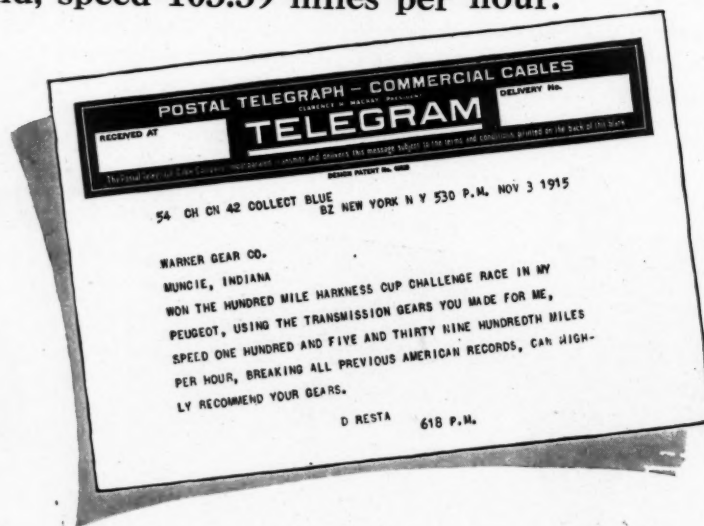
WARNER

"THE RECOGNIZED STANDARD"



Warner Gear Co. Transmissions Again Victorious

Resta, using Warner transmission in his Peugeot, breaks all American records winning 100 mile Harkness Cup Challenge Race at Sheepshead Speedway, New York, Nov. 2nd, speed 105.39 miles per hour.

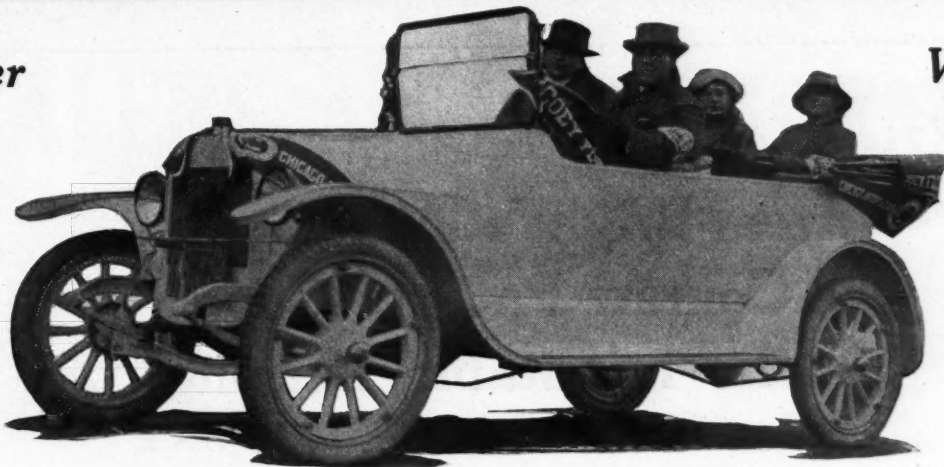


Read Resta's telegram showing his appreciation of Warner dependability. Look for this service in the car you will buy

Warner Gear Company, Muncie, Indiana
Detroit Office 967 Woodward Avenue

Winner

Winner



The COEY Flyer—Price \$650

Specifications: 4-Cylinder L Type Motor— $3\frac{1}{4}$ " bore, 5" stroke cast en bloc; one piece drop forged cam shaft, very liberal bearings on same. Enclosed valves, noiseless, motor overhead detachable, easy access to all valves. Very large exhaust manifold, 3 point suspension, 30 horsepower, high speed, no vibration, all reciprocating parts perfectly balanced. **Rear Axle**—Semi-floating, made to our Specifications. **Front Axle**—I-Beam drop forged, adjustable, Radjax Ball Bearings in hubs. **Transmission**—Selective type, 3 speeds forward, one reverse, mounted on double rows, New Departure bearings with roller bearing in quill gear. The only transmission having this feature. **Clutch**—Cone. Krome leather facing. **Magneto**—High tension. **Carburetor**—One inch S. A. E. Standard. **Lubrication**—Constant level splash pump, operated from cam shaft; positive. **Cooling**—Thermo Syphon System. Zig Zag Mayo type radiator, surplus capacity. **Frame**—Pressed steel, heat-treated, channel section. **Universal Joint**—High grade Spicer. **Drive**—Through torque tube by propeller squared in Universal Joint.

Body—Beautiful streamline with 20 gauge metal gasoline tank under cowl, capacity 12 gallons. Ample leg room, front and rear, full 5-passenger. Color of body, Brewster Green; Black Fenders, Hood, Wheels and Gear. **Weight Complete**—Approximately 1,700 pounds. **Gasoline Mileage**—Approximately 22 miles per gallon, one quart of oil every 300 miles. **Wheels**—Artillery type, clincher rims, demountable. 1 extra rim. **Tires**— $30 \times 3\frac{1}{2}$ Nonskid Tread. **Brakes**—10" external contracting, internal expanding. **Springs**—Front, half elliptic, 30" long; rear, full cantilever, 42" long, hung directly under frame. Our original design. Eliminates all twist in frame. **Steering Gear**—Worm and sector type, adjustment all ways. **Wheel Base**—Full 106". **Tread**—Standard. **Standard Equipment**—Two Head Gas Lamps, Oil Tail Lamp, Extra Rim and Tool Kit, Bulb Horn, Pump, Jack. **Price**—\$650 F. O. B. Chicago uncrated—\$25.00 extra for crating. **Electric Lights**—With electric generator, electric horn, storage battery, \$35.00 extra. **Starter**—Electric Starter, Motor Generator, Electric Head and Tail Lamps, Connecticut Ignition, Electric Horn, \$75.00 extra.

The real selling sensation for 1916.
Dealers are clamoring for this agency—
better get in line—in time—for it's the

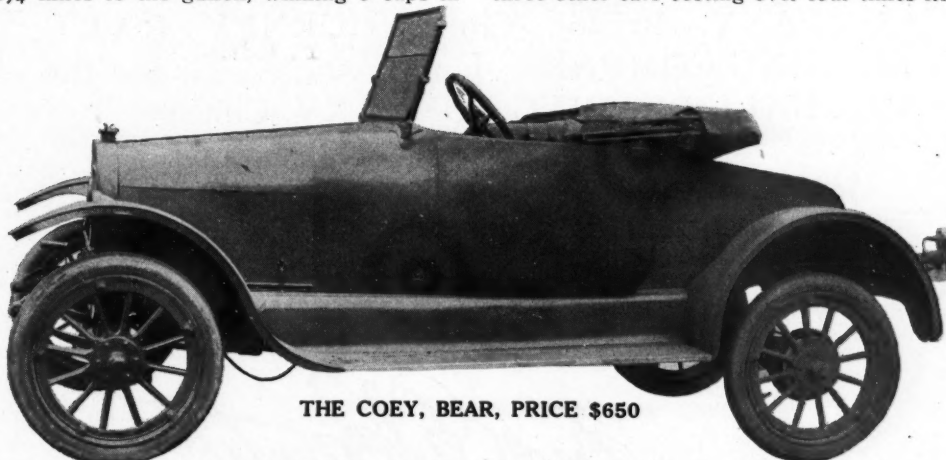
World's Champion Light Car

Its Record: It won the one-hour world's light car international championship race at Detroit, July 5, 1914.

It established a one-mile world's light car championship record the same date and in 7 events won 9 cups. It won the economy and efficiency contest on the Newark, Philadelphia, Atlantic run, covering 250 miles, averaging $35\frac{1}{4}$ miles to the gallon, winning 5 cups in this event.

It won the darkness to dawn contest from New York to Boston, and defeated French cars costing four times its price in the races at Boston, winning 5 cups at this event.

It was the only car in its team winning perfect score in the recent Chicago Motor Club run, competing against three other cars costing over four times its value.



THE COEY, BEAR, PRICE \$650

Agents wanted in unoccupied territory. Immediate deliveries. Address all communications to

COEY MOTOR COMPANY

2010 Wabash Avenue

Chicago, Illinois, U. S. A.

Hess-Bright's Adjudicated Conrad Patents Cover the Inimitable Bearing

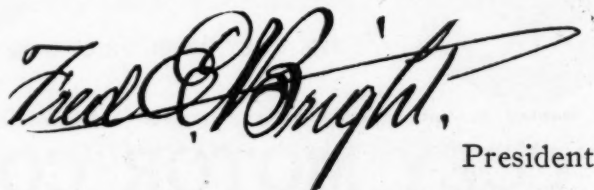
To the Trade:

You have been advised of the broad decisions rendered by the United States Courts in sustaining Hess-Bright's Conrad patents, and it affords us much pleasure to further inform you that the principal ball bearing manufacturers of this country have frankly admitted the validity and basic scope of our patents and have entered into permanent license contracts with us.

A CONRAD PATENT LICENSEE IS A HESS-BRIGHT LICENSEE, therefore it naturally follows that, next to receiving your ball bearing business for our own concern, we are pleased to recommend our fully authorized Licensees, the STANDARD ROLLER BEARING COMPANY, Philadelphia, THE NEW DEPARTURE MANUFACTURING COMPANY, Bristol, Conn., GURNEY BALL BEARING COMPANY, Jamestown, N. Y., and the U. S. BALL BEARING COMPANY, Chicago.

Our aim is to serve the trade in the fairest and most thorough manner possible.

THE HESS-BRIGHT MANUFACTURING CO.


President

DEALERS AND GARAGEMEN

How much money did you make in October?

Will your business show a profit or a loss during 1915?

Have you an accurate and simplified system that will tell exactly where and how you stand all the time?

Do you want your business to grow?

Do you know why it doesn't grow faster?

If you are interested in building successfully for the future you *must* have an adequate accounting system. Lacking that you are as a ship without a rudder, *you will go against the rocks* in shoal water.

Dealers and garagemen in every part of the country are coming to realize the importance—yes, the absolute necessity—for a simplified and accurate accounting system that will enable them to conduct their affairs along sound business lines; that will enable them to acquaint their manufacturers, their jobbers and their banker with the exact status of their business. Every man in the sales and maintenance department of the industry is coming to realize that he must be on an even plane with the other merchants in his community or else be handicapped in ways that work to his positive detriment.

The Right System Has Been Made for You

During the past year Motor World has devised a marvellously simple system of garage accounting that is adequate for the entire establishment—garaging, car, gasoline and oil selling, and repair department.

It is complete in a single binder and obviates the use of journals, ledgers, sales books, cash books and every other old-fashioned "book-keeping" device that means complexity and the need of an expert.

This new accounting system will be presented in Motor World, in six weekly installments, beginning with the issue of Nov. 24th.

Its adoption may mean thousands of dollars in increased profits to you during 1916, and thereafter.

If you are a dealer or garageman and do not take Motor World, send in your subscription at once. Plan to start your business right in 1916. A year's subscription—two dollars for fifty-two complete issues—will prove the best business building investment you ever made.

Motor World is designed and edited for jobbers, dealers and garagemen exclusively. It is the business paper for the merchants and service men of the industry. You can't afford to be without it if you are in business to make money. Pin two dollars to the coupon and send it in right away. Give yourself a six weeks' course in practical and simplified accounting.

The Motor World Publishing Co.

M.A.

239 W. 39th Street, New York.

Please enter my order for 52 issues of *Motor World*, beginning Nov. 24. Include your big "Before Show" issue of 300 pages (out Dec. 22), which will illustrate and describe, giving complete specifications, prices, etc., all the leading cars and accessories manufactured in America. For all of which please find two dollars enclosed.

Name

Address

Please check the departments of the business in which you are engaged

| | |
|---|--|
| <input type="checkbox"/> SELL CARS | <input type="checkbox"/> OPERATE GARAGE |
| <input type="checkbox"/> SELL ACCESSORIES | <input type="checkbox"/> OPERATE REPAIR SHOP |

Don't Pay Less Than \$7.50 for Your Searchlight!

Try an OWL on
your car for
10
days

Write for full
information



You are not getting the best searchlight on the market unless you get the Owl with its patented Foster Universal Swivel Joint—the only flexible, adjustable, slip-proof, rattle-proof joint of its kind.

It is mechanically impossible for it to stick, stiffen or loosen—it is cleancut, compact, self-contained. No ugly protruding thumb nuts or unsightly complicated construction.

Add a dollar or two to what you would have to pay for an ordinary searchlight—and get a guaranteed quality OWL which will outlast your car.



Built to withstand the roughest usage. Cannot be shaken to pieces. Will not rattle, loosen, topple or slip. Can be turned in ANY direction. Its first cost is final. Adds wonderfully to the car's appearance—does not cheapen it. More powerful than much larger searchlights. Remarkably light, compact, durable. Easily attached to the windshield or foredoor of any car.

All these features of superiority considered, the OWL is really the most economical searchlight obtainable. Demand the OWL and accept no substitute!

Price, \$7.50 Complete

At all high-grade dealers, or if your dealer cannot get it for you, sent direct on receipt of price. Write for free booklet describing and illustrating many uses for the OWL.

In ordering state make, year and battery voltage of car.

Dealers Wanted Everywhere

C. H. FOSTER ACCESSORIES COMPANY, 2303 Michigan Avenue Chicago, Ill.

When Writing to Advertisers, Please Mention Motor Age

No center bolt

*Guaranteed forever
against center breakage*



*The spring with
NO CENTER BOLT*

Replace it with a Tuthill Titanic Spring

**Easiest to get anywhere. Outsells and outlasts all others.
There's a Tuthill unbreakable Titanic for any make of car**

DEALERS — write to your nearest Tuthill distributor

| | | |
|---------------|---|---|
| Albany | - | Albany Hardware & Iron Co. |
| Atlanta | - | Elyea-Austell Co. |
| Baltimore | - | Hub Wheel & Mfg. Co. |
| Boston | - | Post & Lester Co. |
| Buffalo | - | H. D. Taylor Co. |
| Chicago | - | All Jobbers |
| Cincinnati | - | The Ohio Rubber Co. |
| Columbus | - | Griswold-Sohl Co. |
| Dallas | - | The Fisk Co. of Texas |
| Davenport | - | Sieg Iron Company |
| Dayton | - | S. T. & G. A. Gebhart |
| Denver | - | Auto Equipment Co. |
| Duluth | - | Kelley-How-Thomson Co. |
| El Paso | - | Western Motor Supply Co. |
| Florence | - | D. W. Alderman, Jr. |
| Indianapolis | - | W. J. Holiday Co. |
| Kansas City | - | Faeth Iron Store Co. |
| Lincoln | - | Nebraska-Buick Auto Co. |
| Los Angeles | - | Chanslor & Lyon Co. |
| Milwaukee | - | Babcock Auto Spring Co. |
| Minneapolis | - | Western Motor Supply Co. |
| Nashville | - | Auto Supply Co. |
| New Orleans | - | Interstate Electric Co. |
| New York | - | W. E. Pruden Hardware Co. |
| Oakland | - | Chanslor & Lyon Co. |
| Peoria | - | The National Electric & Auto Supply Co. |
| Philadelphia | - | Manufacturers Supplies Co. |
| Pittsburg | - | Pittsburg Auto Spring Co. |
| Portland | - | Chanslor & Lyon Co. |
| Rochester | - | Sidney B. Roby Co. |
| St. Louis | - | Auto Devices Co. |
| San Antonio | - | The Fisk Co. of Texas |
| San Francisco | - | Chanslor & Lyon Co. |
| Seattle | - | Chanslor & Lyon Co. |
| Sioux Falls | - | The H. F. Brownell Co. |
| Spokane | - | Chanslor & Lyon Co. |
| Tampa | - | The American Supply Co. |
| Toledo | - | Union Supply Co. |

Foreign Distributors:

Automobile Sundries Co., 18 Broadway, N. Y.

Costs no more than ordinary spring

The Tuthill Titanic is a strong, flexible, easy-riding spring that will add to your riding comfort over rough roads and enable you to take railroad crossings at full speed—it is the triumph of 35 years of spring building.

A Tuthill Titanic will last longer than your car because it has no weakening center bolt or center nib. They come Dann equipped if desired.

Write today

If you have any spring suspension trouble — write our Engineering Department for expert advice — free upon request.

OWNERS OF MOTOR TRUCKS WITH WORM-DRIVE CON- STRUCTION WARNING

Leading automobile engineers warn truck owners that the worm drive construction puts an extra stress on the spring that will shear off the center bolt or break the spring in the center.

Tuthill Titanic Springs have no center bolt and are guaranteed forever against center breakage.

Write our Engineering Department for the facts.

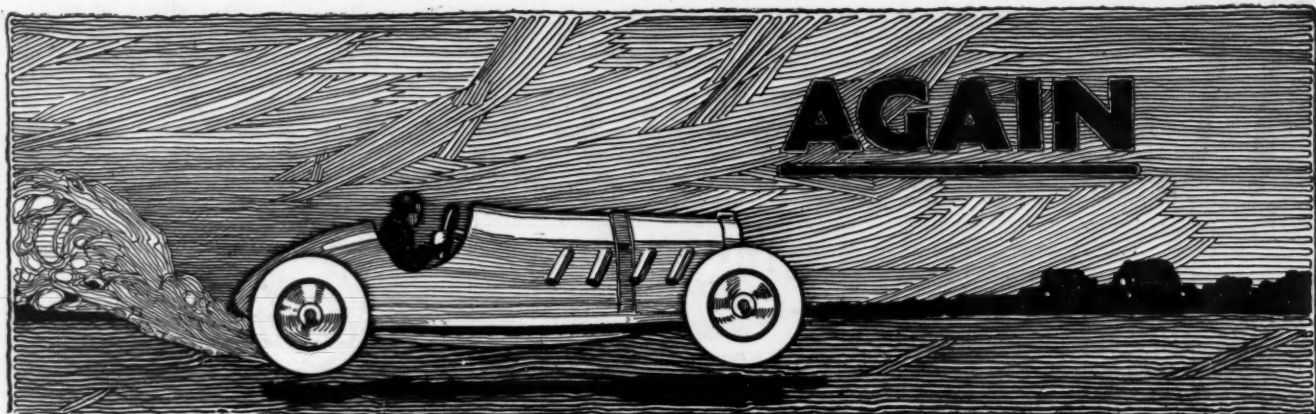
TUTHILL SPRING COMPANY

772 POLK ST., CHICAGO, U. S. A.



**Tuthill Titanics are guaranteed
forever against center breakage**

**Tuthill "Titanics" can be adapted easily
to any axle construction and quickly
mounted without any extra expense.**



Three More Sweeping Bosch Victories

Bosch Magneto Ignition again shows conclusively that it is the most reliable and efficient ignition.

Burman in Blitzen Benz Establishes a
World's Track Record: 2 miles—116 m. p. h.

—Bosch Magneto Ignition Used—

De Palma-Burman Match Race Establishes
World's Competition Records:

4 miles—111.97 m. p. h. 6 miles—113.86 m. p. h.

—Bosch Magneto Ignition Used—

The 100-Mile Match Race Establishes New
American Speedway Record:

1st, Resta- Peugeot—105.39 m. p. h.

2nd, Burman- Peugeot—102.43 m. p. h.

3rd, Rickenbacher-Maxwell— 98.33 m. p. h.

—Bosch Magneto Ignition On All—

(There was No Ignition Trouble D

There is no difference of opinion among the close students of the motor car. They adopt Bosch Ignition, not only because Bosch is more speedy, not only because Bosch is more capable, but mainly because the Bosch Magneto is

The Most Reliable Ignition System
Be Satisfied Specify Bosch

BOSCH MAGNETO CO., 214 W. 46th St., New York



A new Abbott-Detroit model—a six—designed and built—as every other Abbott-Detroit model has been by M. J. Hammers.

And this forthcoming model is Hammers' supreme achievement—not a rival to the Abbott Eight, understand—but a startling addition to the Abbott line—A low priced car—but *not* a cheap car—Hammers never built a cheap car in his life—he never will build one.

The new Abbott will be a quality car—luxurious in finish and equipment—new and thoroughly characteristic in its lines—quality and beauty and power sticking out all over it—and the price will be under \$1200.

Distinctly a car for the discriminating buyer—

And for the dealer who wants a car of low price to sell to men who know motor car quality when they see it.

Keep your eye out for the detailed
announcement—It's coming—soon—
In the meantime—Write for territory

CONSOLIDATED CAR COMPANY, Detroit, Michigan



The Big "Push!"

—and how you can "Cash In" on it

Our big advertising campaign of full pages in the Saturday Evening Post and seventeen other big National mediums is under way. Hundreds of thousands of motor car owners are talking of Campbell Detachable Upholstery. Thousands have already bought.

Are you getting the benefit of this tremendous publicity? Is your cash register hauling in the dollars that this intensive selling is bringing to the motor car trade?

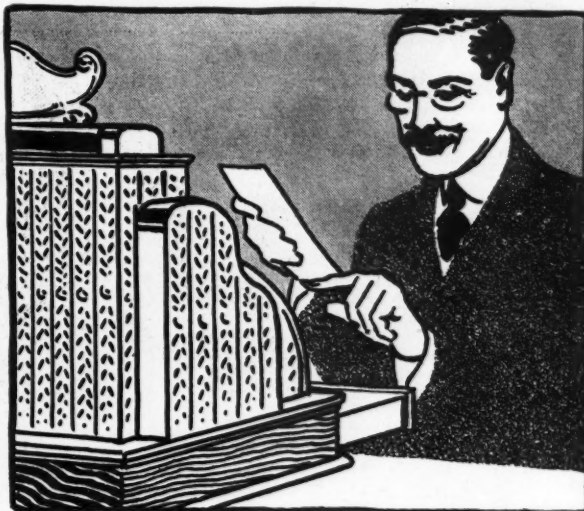
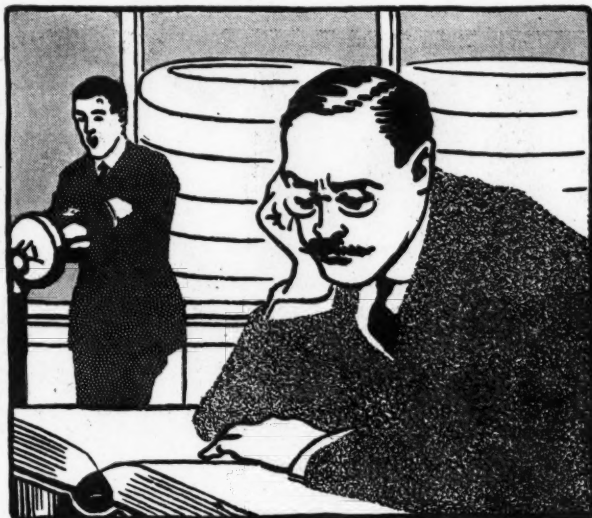
Write or wire us for details of our plan to help you get this new equipment business.

Let us send samples and new prices on the most luxurious, smartest accessory you can put on a motor car.

Act now! The big "Push" is started! Pull with it! There's money in it for you. The Perkins Campbell Co., 624 Broadway, Cincinnati, O. New York Office, 89 Chambers St.

Dealers: Write for samples, discounts and big co-operative selling plan

When Writing to Advertisers, Please Mention Motor Age



Stop Figuring Losses—Ring up Profits THIS LETTER SERVICE BRINGS THE BUSINESS

Do you get this Extra Profit?

Are your men idle part of the time? Are they bringing you a big profit or do you just break even?

You can do more overhauling. You can do more body painting. You can do more tire repairing. You can make collections easier. You can get all this extra business by the simple Goodyear Letter Service.

What this Service is

We prepare a series of letters for you, to fit your own special conditions. These letters have a 'punch', a pulling power, that has already been proven by hundreds of dealers the country over.

These letters go to you complete, ready to sign and mail. There is no bother on your part. The service includes letterheads and envelopes in colors, with your name on them, also stamps and stamping, filling in your customers' names, addressing; absolutely complete service in every detail.

Every Penny Back

For all this work the cost to you is only a trifle. But remember this—if these letters fail to pay you back their cost in increased business, we return to you the full purchase price, making the Service free.

Goodyear
AKRON

Why we make this Offer

This offer is simply a part of the Goodyear selling policy. Dealers are buying Goodyear Tires and Goodyear Tire Accessories. But we consider our duty only half done when we sell you Goodyear products.

We help you sell the consumer too—that's to our mutual advantage. You haven't time to study selling problems as carefully as we do. So we lend you our merchandising and advertising experts. They can do for you what they have done for us.

These men are helping dealers fight their selling battles and win against rising costs—unfair competition—smaller margins.

We gladly send you these vital facts—with figures and letters from other winning dealers. Simply tear off coupon and mail to us today.

THE GOODYEAR TIRE & RUBBER CO.
AKRON, OHIO

This Coupon brings Sales Making Plan

THE GOODYEAR TIRE & RUBBER CO.,
Auto Tire Dept., Akron, Ohio

Please send me without obligation, your complete Dealers Letter Service Proposition, with facts, figures and profits.

Name _____

Address _____

RAYFIELD

CARBURETORS

The Rayfield Carburetor is used as standard equipment on more high grade cars than any other carburetor on the market.

This dominance can be explained by superiority alone.

Take this superiority and use it, whether you are owner, dealer, or manufacturer.



Some of the cars which are a character-reference for Rayfield

| | |
|----------------|----------|
| Chalmers | Haynes |
| National | Chandler |
| Paige | Mitchell |
| Winton | Apperson |
| Westcott | Premier |
| Stearns-Knight | |

FINDEISEN & KROPF MFG. CO.
2109 Rockwell Street, CHICAGO

1140 Michigan Ave.,
CHICAGO

Branches:
1902 Broadway,
NEW YORK

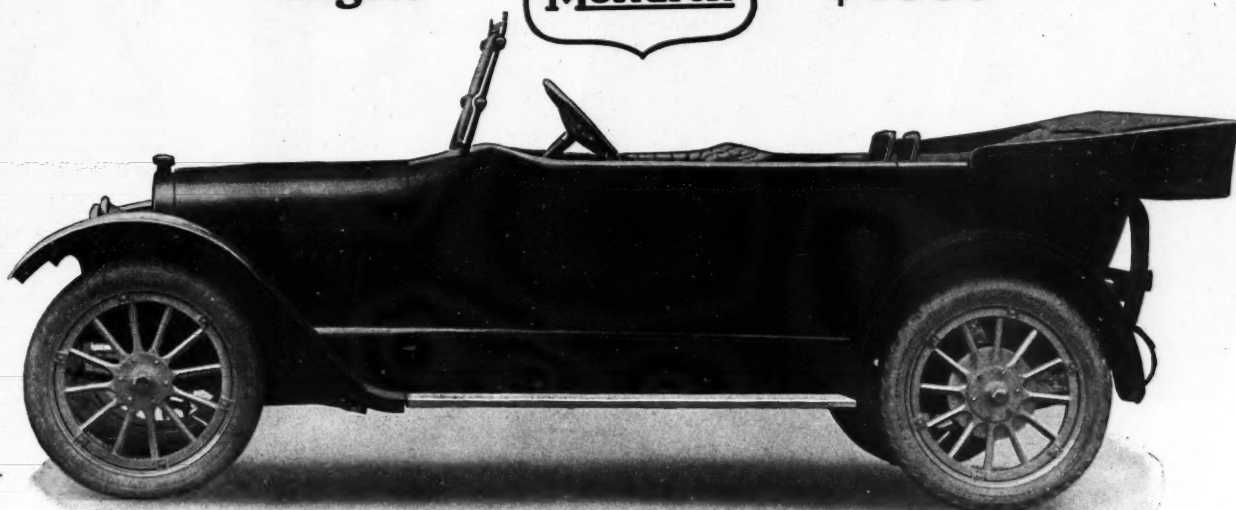
1214 Woodward Ave.,
DETROIT

When Writing to Advertisers, Please Mention Motor Age

Eight



\$1500



Performance Proves a Thoroughbred

THE distinctive beauty of the Monarch—the long flowing lines of the body, the slanting windshield, the perfectly crowned fenders, the exclusive taste and perfect workmanship of each part—attracts the attention of every observer, but its performance is what proves it a real thoroughbred. Clean cut, handsome, and a leader in its field as the blue grass horses of Kentucky were in theirs, the Monarch Eight proves its superiority in every test in the same whole hearted manner.

Monarch

of them all

Hills, deep sand, heavy roads, all the discouragements to motoring in the ordinary car melt into insignificance before the Monarch. Its eight cylinder master-motor develops upwards of sixty horsepower at only an ordinary engine speed. Its flexibility gives a range of two miles an hour to sixty without changing gears. For the weight and wheelbase, it is the most powerful high grade car made, and one of the easiest riding.

In power, speed, and the ability to stand hard usage the Monarch is a man's car, one the hardest driver will be proud to own. In ease of control, comfort and handsome appearance it appeals at once to every woman. It is a car which not only sells readily but stays sold and brings more purchasers, and a car every far-sighted dealer will be glad to handle.

Wheelbase is 125 inches. Body is latest flush type, seven passenger capacity. Front seats are divided and auxiliary seats fold out of the way when not in use. Cushions are tilted and upholstery genuine long-grained leather. Tires are oversize, safety tread on rear. Equipment unusually complete.

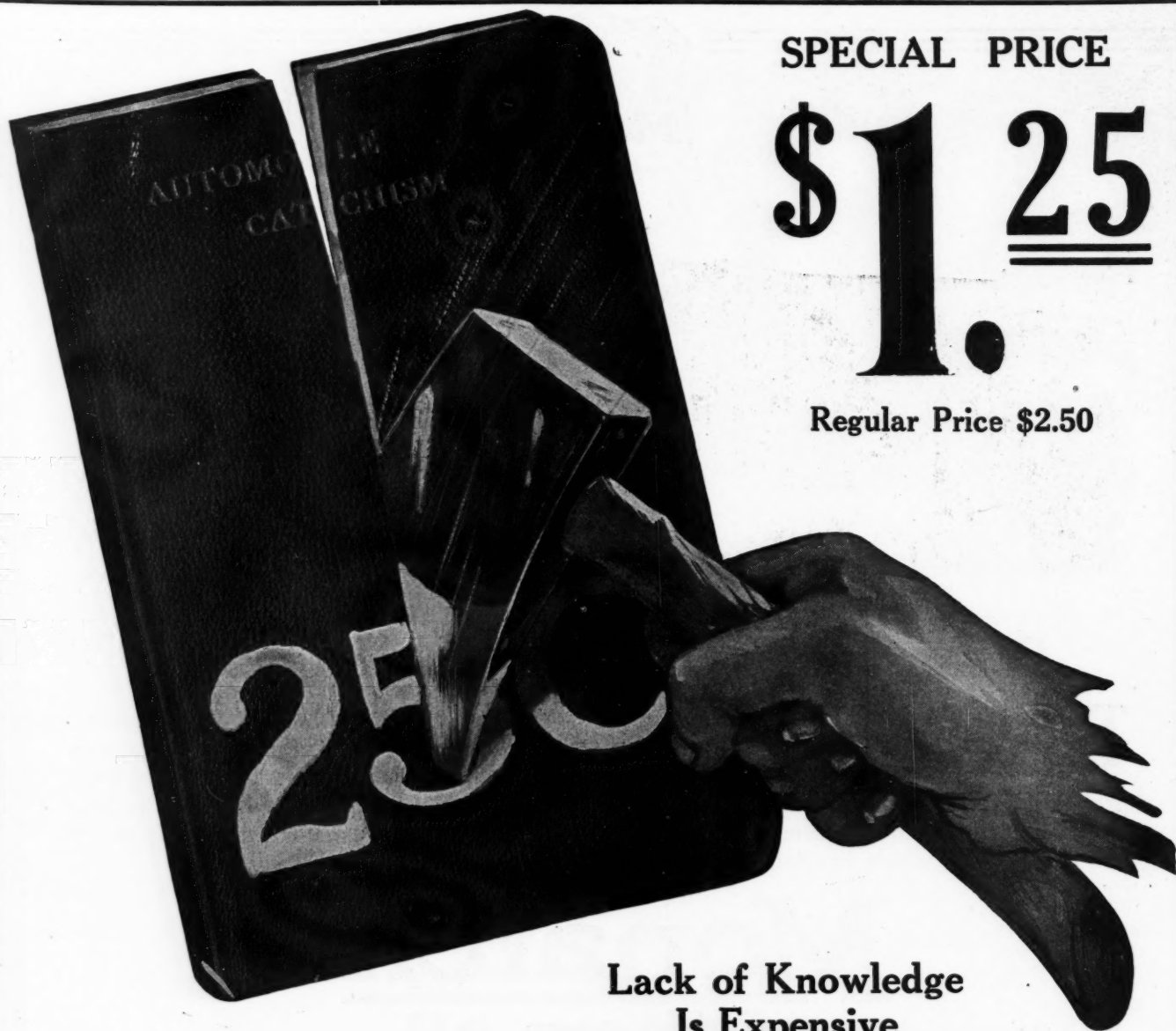
The price is \$1500. Territory is going rapidly. A few responsible dealers desired. Write or wire for particulars.

*"The Road
Beauty
of 1916"*

MONARCH MOTOR CAR CO.

R. C. HUPP PRESIDENT
DETROIT, U. S. A.

*"The Car
With the
Silver
Wheels"*



SPECIAL PRICE

\$1.25

Regular Price \$2.50

Lack of Knowledge Is Expensive

"THE AUTOMOBILE CATECHISM" (de luxe edition) is a complete course in automobile instruction—each subject discussed and illustrated so that YOU will grasp every point worth while—every subject is made as simple as A B C. You are interested—you are instructed—you are directly benefited. Its information is final.

It's a handsome piece of book work—splendidly printed, with 101 illustrations; flexible black leather binding, rounded corners and gold-edged pages—beautiful, while being intensely practical.

It will be to your immediate financial advantage to acquire an intimate and practical knowledge of cars and their parts.

We want every reader of Motor Age to have a de luxe copy of "The Automobile Catechism." To make our offer irresistible we have decided, **FOR A LIMITED TIME ONLY**, to **CUT THE PRICE IN**

TWO. This half price (\$1.25) will prove the best investment you ever made. Remember, this is the de luxe edition—264 pages—every page full of real, money-interest value.

Put your name and address on the corner coupon, tear from the page, enclose \$1.25 and mail today to—

THE CLASS JOURNAL COMPANY,
910 S. Michigan Ave., Chicago, Ill.

Gentlemen: Enclosed please find \$1.25, for which send me a copy of "The Automobile Catechism" (de luxe edition).

Name

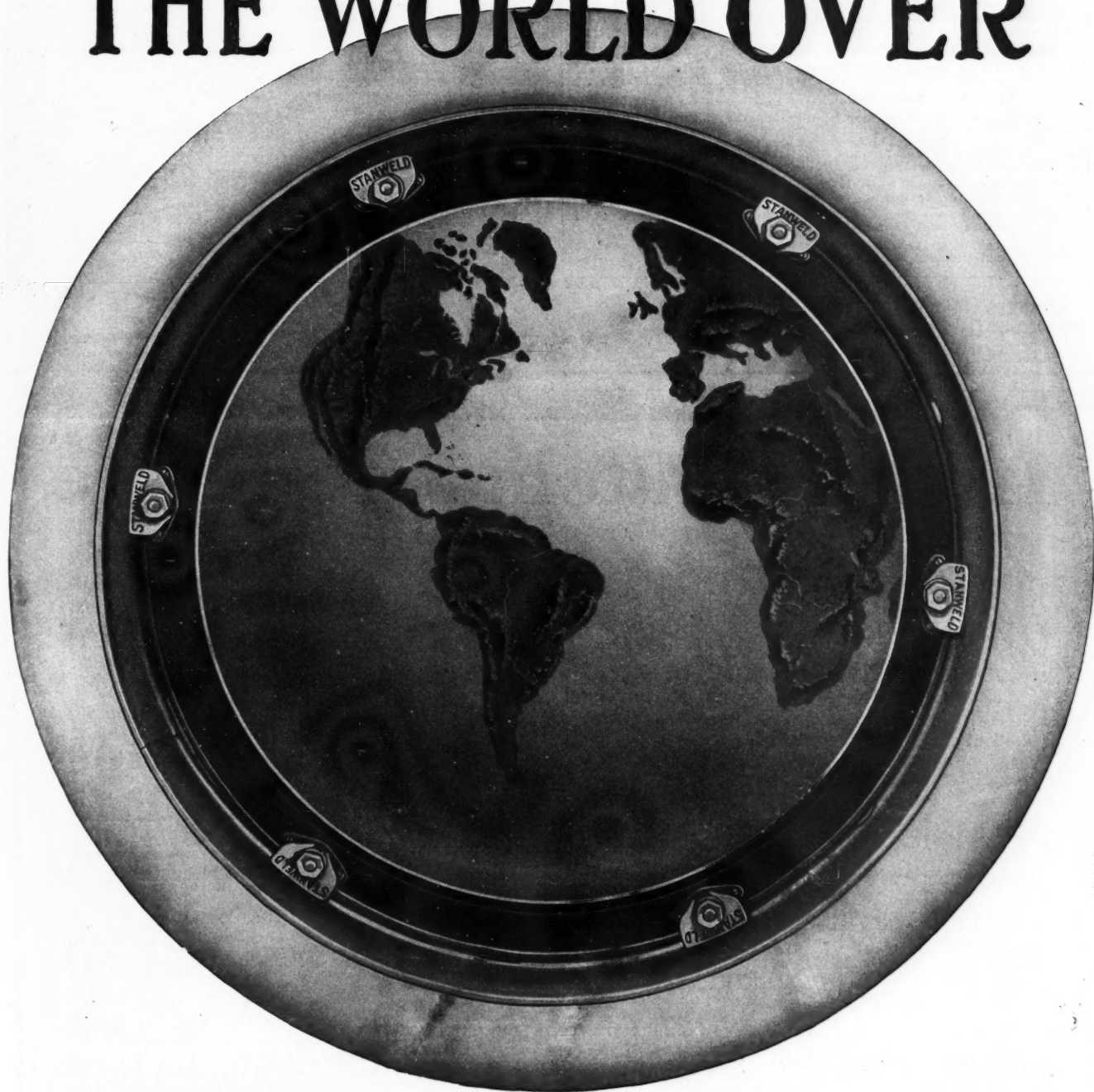
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THE CLASS JOURNAL COMPANY

910 S. Michigan Ave., Chicago, Ill.

STANWELD RIMS

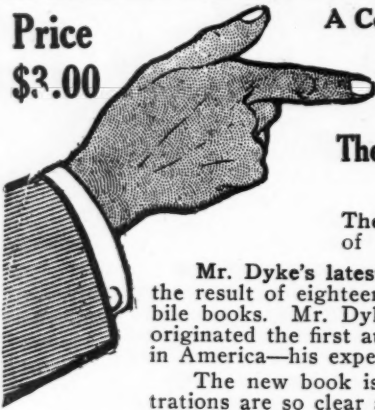
THE WORLD OVER



THE STANDARD WELDING COMPANY, CLEVELAND.

When Writing to Advertisers, Please Mention Motor Age

Price
\$3.00



A Complete, Simplified, Practical Book on Everything Pertaining to Automobiles in the World

Enlarged Revised Edition

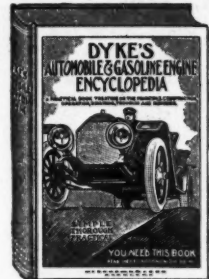
Now Ready

The Late Edition Is Improved at Least One Hundred Per Cent With a Complete Ford Instruction Added

The First Practical Automobile Book was, "Dr. Dyke's Diseases of a Gasoline Automobile and How to Cure Them"—1900

Mr. Dyke's latest book; Dyke's Automobile and Gasoline Engine Encyclopedia, is the result of eighteen years' practical experience and fifteen years of publishing automobile books. Mr. Dyke also built early models of both gasoline and electric machines, originated the first auto supply business and manufactured the first float feed carburetor in America—his experience is worth something to you.

The new book is so thoroughly simplified anyone can understand—in fact, the illustrations are so clear and minutely detail you hardly need refer to the text.



A teacher, guide and reference on everything pertaining to motoring. Simple as the A B C's. It's worth ten times its cost if only placed on the shelf and used as reference. 1750 illustrations instead of 1200. 49 instructions instead of 40. 640 pages instead of 508.

Some of the New Subjects Added:

Electric Starters, Generators and Lighting Systems—up to date—see table of contents instruction number 25 to 32; also 19.

Six, Eight and Twelve Cylinder Engines. See Instruction 11.

Valve Timing and Ignition Timing—simplified so a ten year old boy can understand. See table contents, instruction 9, 10 and 24.

A complete Ford Instruction.

Repairing.—This subject has been enlarged and greatly improved—many new subjects and illustrations added—everything you want to know from making a home-made magnet recharger to building and equipping a garage for home or business and how to make all repairs and adjustments in an intelligent manner.

You will understand how to diagnose troubles by a process of elimination—in other words you will become a real expert.

Over one hundred thousand Dyke books sold—not one returned—yet a two day trial examination is allowed.

Lack of space prevents a lengthy description, therefore see the table of contents and read the subjects treated.

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FORD INSTRUCTION (a supplement of 32 pages), DISAPPEAR, INDEX

Note the number of instructions and number of pages to each

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Motor Age

910 So. Michigan Avenue, Chicago

Audel's Automobile Guide

WITH
Questions, Answers and Illustrations
FOR

OWNERS

OPERATORS

REPAIRMEN

Relating to The Parts, Operation, Care, Management, Road Driving Carbureters, Wiring, Timing, Ignition, Motor Troubles, Lubrication, Tires, etc.

Including chapters on the Storage Battery, Electric Vehicles, Motor Cycles, Overhauling the Car and an Appendix on Self Starters and Lighting Systems.

By GIDEON HARRIS and Associates

A Book Worth Having "UNDERSTAND YOUR CAR"—Explained in the following chapters:

1. Ready Reference Index.
2. The Automobile.
3. The Gas Engine.
4. The Cycle of a Gas Engine.
5. Brief Outline of Gas Engine Principles.
6. Cooling Systems.
7. Fuels.
8. Carbureters.
9. Ignition.

10. Timing and Balancing.
11. Gas Engine Operation.
12. Clutches.
13. Transmissions.
14. The Drive.
15. The Differential.
16. The Running Gear.
17. Tires.
18. Brakes.
19. Ball and Roller Bearings.

20. Lubricants and Lubrication.
21. Motor Cycles.
22. Electrics.
23. Electricity.
24. Dynamos and Motors.
25. Storage Batteries.
26. Methods of Circuit Changing.
27. How to Run an Automobile.
28. Overhauling the Car.
29. Starters and Starting Systems.
30. Electric Lighting and Wiring.

550 Illustrations,
700 Pages, Flexible
black leather
binding.

PRICE
\$1.50

Postage Paid

ORDER FROM BOOK DEPARTMENT.

MOTOR AGE, 910 South Michigan Avenue, CHICAGO, ILLINOIS



DODGE BROTHERS

WINTER CAR

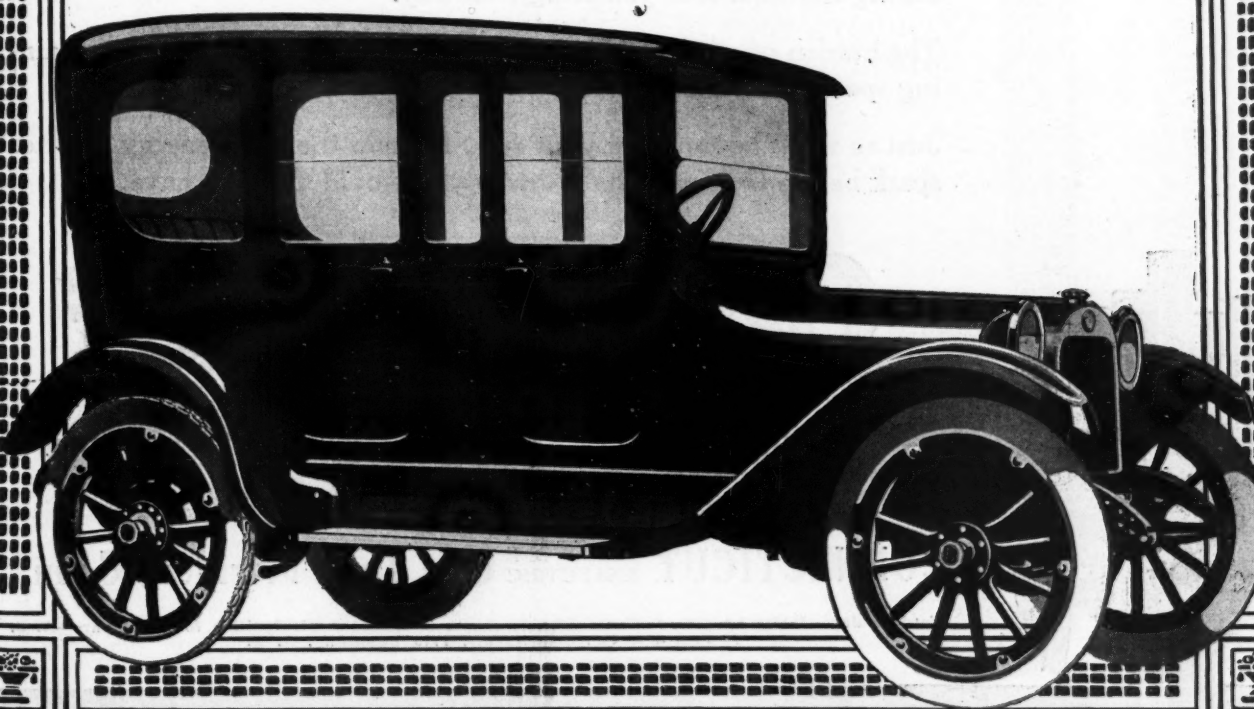
Substantially built to withstand the roughness of winter driving; these tops are so light that they add nothing to the cost of operating the car

The protection from the weather is complete. The finish outside and inside is in keeping with the finish of the car. The tops are cloth-lined and are electrically lighted.

The motor is 30-35 horsepower
The price of the Winter Touring Car or Roadster complete, including regular mohair top, is \$950 (f. o. b. Detroit)

Canadian price \$1335 (add freight from Detroit)

DODGE BROTHERS, DETROIT



GATHERING HEADWAY



You must have noticed the way a locomotive puffs and struggles to get its train started—the way steam escapes from the cylinders all during the time it is gathering headway.

The burden of getting the wheels rolling is far greater than in sustaining speed once it is acquired.

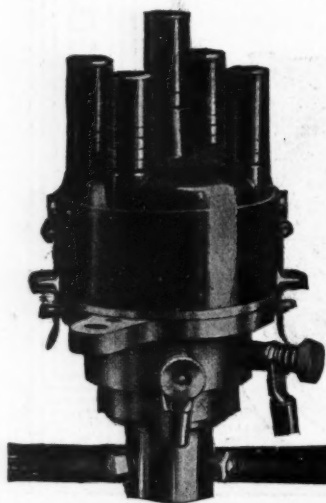
Just so with the motor in your car. It needs the extra energy a hotter spark begets to give it the getaway you would like it to have.

AUTOMATIC · IGNITION CONNECTICUT

delivers its hottest spark for starting and throughout the lower ranges of speed.

CONNECTICUT TELEPHONE & ELECTRIC CO., Inc., Meriden, Conn.

Ford Dealers—Write for information regarding Connecticut Automatic Ignition for Ford Cars—A. J. Picard & Co., Sole Agents, 1720 Broadway, N. Y.



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Transmissions

In these days of severe price competition it is decided advantage to obtain a high grade, thoroughly dependable product at a price which enables you to meet competition.

You can do this with COVERT TRANSMISSIONS. Their quality and efficiency cannot be excelled and their incorporation in your product will mean a car that can compete with its field both in quality and price.

*Consult our engineers
about your problems*

Covert Motor Vehicle Co.

Factory
Lockport, N. Y.

Sales Office
Detroit, Mich.

Friendliness

is the result of acquaintance and appreciation; the response to appeal of personality. This spirit of companionship is rarely felt toward mechanism and when expressed is the highest compliment of judgment.

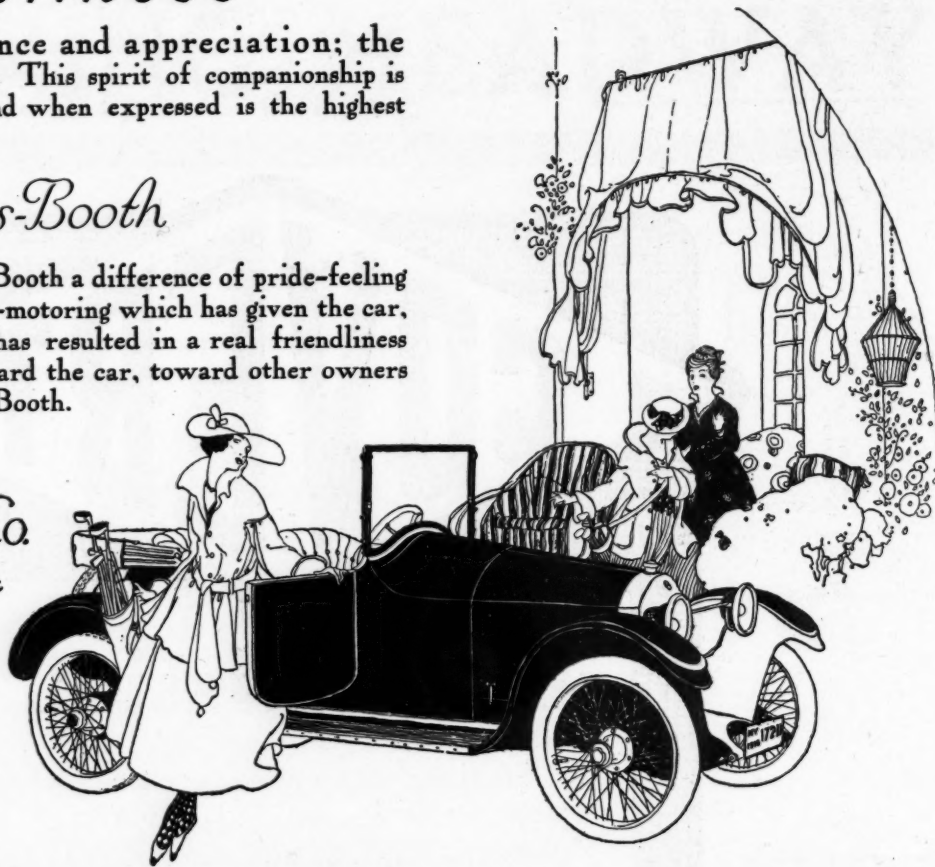
Scripps-Booth

owners have felt in the Scripps-Booth a difference of pride-feeling and a new enjoyment of comfort-motoring which has given the car, to them, a real personality and has resulted in a real friendliness on the part of these owners toward the car, toward other owners and toward everything Scripps-Booth.

Scripps-Booth Co.
Detroit, Mich.



Roadster \$775
Coupe \$1450



MAKE \$250⁰⁰ A MONTH REPAIRING AUTOMOBILE TIRES

Sounds like a lot of money—IT IS—A WHOLE LOT of MONEY to be earning CLEAR every month—yet it's what hundreds of men we have established in the Automobile Tire Repair Business are making. You let down the DRAW BRIDGE for SUCCESS to enter into your career by getting into business for yourself. The business for you is the one where investment is small—the returns quick and for cash—where the margin of profit is large—the demand for your PRODUCT or SERVICE constant and ever on the increase.

A Haywood Tire Repair Equipment

tainty of success in this business is as sure as anything in this world can be—Each year adds thousands of new Automobile Owners—they need YOU to keep their tires in service.

Here Is Your Opportunity!

Be first to enter this new, big paying business in your town. Open your pockets. Let the dollars pour in. Act quick. Every auto sold means more tires to mend. Automobile business is growing fast—enormous field for tire repairing. Punctures and blowouts are common. Tires need retreading and vulcanizing. Something going wrong all the time. Thousands forced to buy new tires because they can't get old ones fixed. Think of the old bicycle days—repair shops on every corner—all making money—busy day and night. Autos make same proposition over again—only ten times bigger and better. Users of Haywood Tire Repair Plants are making big money. Johnston, Tex., writes: "I have made as high as \$18 in a day." Another man who bought a plant September, 1911, writes he has cleared over \$3000.00. That's going some! Operate a plant as a side line in connection with auto business—garage or as an independent business. Find neighborhood where there's a bunch of autos—get all the steady business besides transient work. Experience unnecessary. You learn quick. Simply follow directions—practice a few days on a couple of old tires and you'll be ready to coin money. Business comes fast and easy.

HAYWOOD TIRE & EQUIPMENT COMPANY 720 N. Capitol Ave. The New Money-Making
INDIANAPOLIS, IND. Business—Start Now

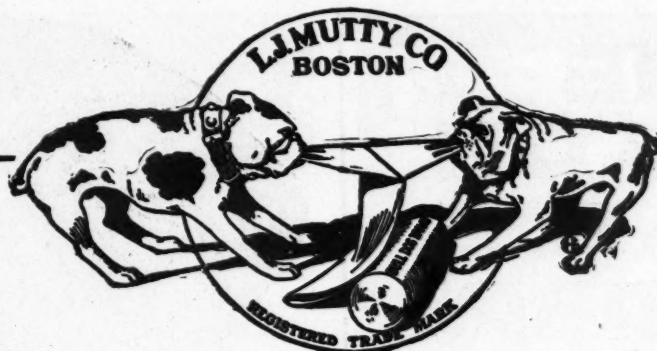
answers to all of these requirements of Old Dame Fortune—the cer-

This Man is Making Money



Repair Tires At Home

Young men! and boys repair father's tires—get money he pays garage man. Get the neighbor's work. Make money to attend college or to start a garage and repair business. Auto owners—repair your own tires—save money—pay for your outfit in short time. We have outfits for home use. Anyhow, investigate. Send today for catalogue. See the wonderful possibilities in this marvelous field. Learn of the enormous money-making opportunities in this fascinating new business.



Waterproof

Easily said but it takes brains and skill to accomplish this in connection with fine fabrics.

We offer you the result of years of manufacturing skill and experience and when we say that a piece of fine serge has been made waterproof, or that our mohairs are waterproof you may be certain they are just what we state.

Waterproof

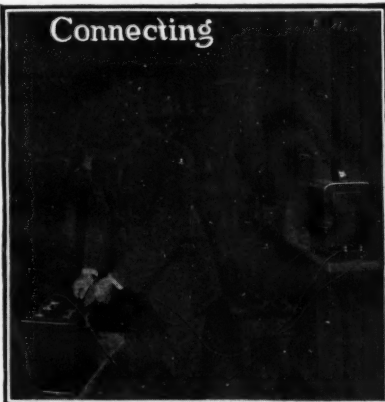
Our specialties are high grade waterproof fabrics for auto tops, curtains and upholstery. The best in waterproof fabrics are termed BULL DOG QUALITY. Specify them when you order.

We serve many of the largest manufacturers.
We would like to be of service to you.

May we send you samples?

L. J. MUTTY CO., Boston, Mass.

Connecting



The cost of fully charging is extremely small—about 1½c per hour.

The increased life of batteries and the assurance of positive starting and good lighting will amply repay you for the initial cost of this remarkably efficient battery charging outfit.

If your dealer does not stock them, write our nearest representative.

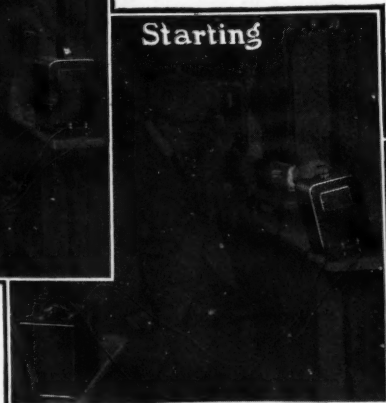
The Real Rectifier for Small Batteries

Your battery instruction book emphasizes—"Keep the battery fully charged."

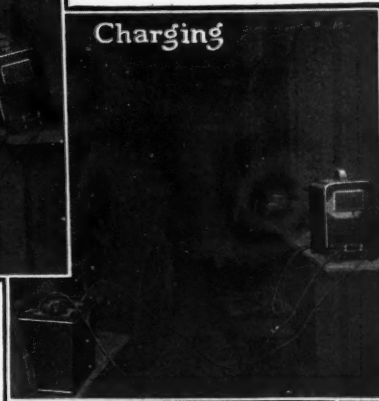
The new portable Mercury Arc Rectifier makes battery charging at home simple and convenient.

Because of its small size and weight it can be carried to and plugged into the nearest lamp socket, connected up to the battery and left till charging is complete.

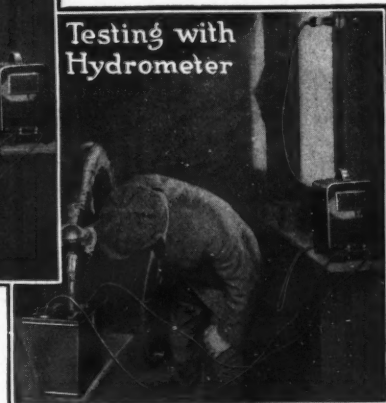
Starting



Charging



Testing with Hydrometer



General Electric Company

General Office: Schenectady, N. Y.



Sales Offices in All Large Cities

5848

THE STAUDE GLARE STOPPER



(Patent applied for)

The Staude Glare Stopper

The heavy clear amber-colored crystal lens glass, 6 3/4 inches in diameter, disperses the light rays and eliminates all glare. The nickel plated clamp will fit on the windshield of any make of automobile.

RETAIL PRICE

\$2.50

The Staude Glare Stopper makes driving at night a constant pleasure instead of a constant fear. All glare from the headlights of approaching automobiles is eliminated by the Staude.

The Staude Glare Stopper is not "tinny" looking. It adds to the appearance of any automobile.

Made of heavy highly polished amber glass, the Staude will not curl or fade like celluloid.

A specially designed joint in the arm allows the Staude to be kept horizontal when not in use and perpendicular at night without regard to the angle of the windshield. The Staude will not work loose and rattle.

You can purchase a Staude from most dealers, or we will send you one by parcel post—C. O. D.

The Staude is sold with an absolute money-back guarantee. If you are not delighted with the Staude Glare Stopper and convinced you cannot get along without it, return it and your money will be refunded immediately.

DEALERS

The Staude Glare Stopper is one of the fastest selling accessories on the market today. It solves the headlight problem at the right end. Write for our jobber's and dealer's proposition.

E. G. Staude Manufacturing Co.
2675 University Avenue St. Paul, Minn.

Dear Sirs:

Please send me by Parcel Post, C. O. D. \$2.50 prepaid, one complete

STAUDE GLARE STOPPER

with the understanding that I may return it, if unsatisfactory, and get my money back.

Make of Car.....

Name

Address

City State.....



Ask Any Chauffeur

Which is the best pump. They know from experience. The man who leaves the selection of a tire pump to his chauffeur will find that he will get a bill for a



There is a double moral to this. If the owner investigates he will find, invariably, that the chauffeur selected a Bridgeport Pump because it does the work quicker and with less effort than any other on the market.

The demand for Bridgeport Pumps has put our production on a tonnage basis.

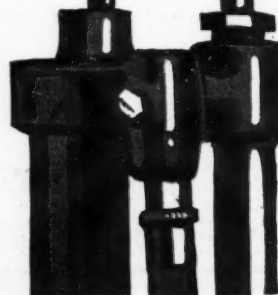
Bridgeport Pumps are one of the outstanding examples of quality and quantity combined.

We are the world's largest producers of Automobile Tire Pumps.

We guarantee to give a better pump for less money than any other manufacturer.

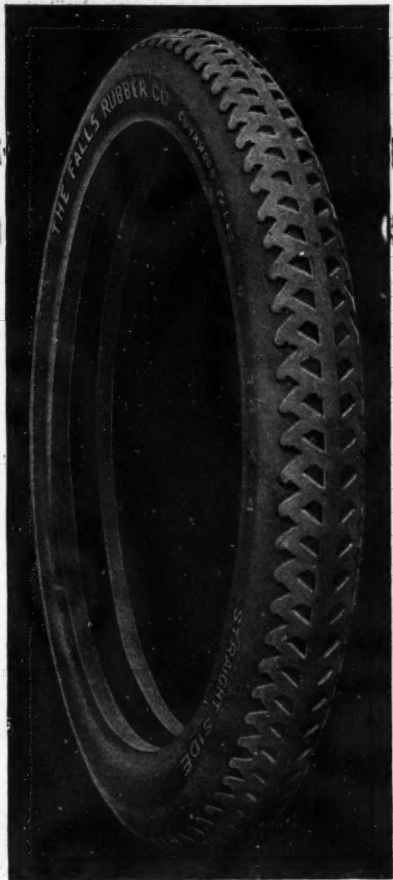
**Bridgeport
Brass
Company**

**Bridgeport,
Conn.**



When Writing to Advertisers, Please Mention Motor Age

"FALLS" TIRES



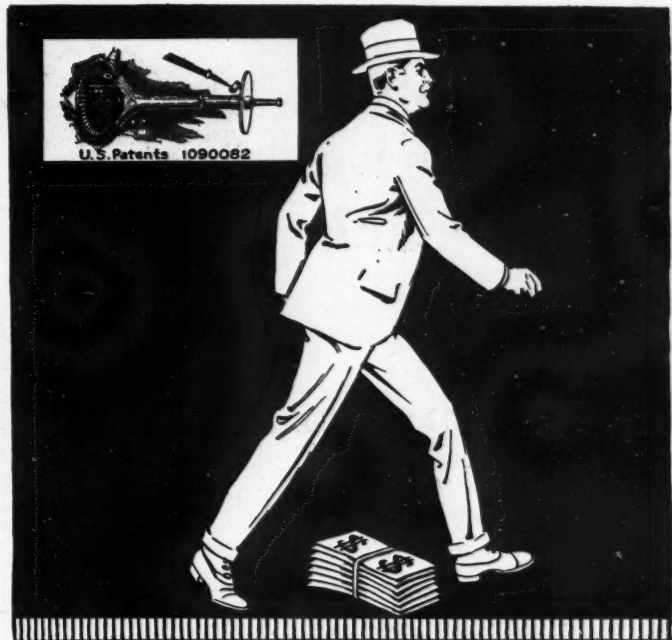
Falls tires look good and wear better. Users say they cost less per mile. Write for the proof.

Guaranteed 5000 Miles

The Falls Rubber Company, Cuyahoga Falls, O.

BRANCHES AND DISTRIBUTORS

The Falls Rubber Co. 2001 Euclid Ave., Cleveland, Ohio
 The Falls Tire Co. 2307 Indiana Ave., Chicago, Ill.
 The Denver Rubber Co. 516 16th St., Denver, Colo.
 The Myers-Hoffman Tire Co. . . . 1520 Jefferson Ave., E. Detroit
 The Servus Vulcanizing Co.
 Tunnel St. & Webster Ave., Pittsburgh, Pa.
 Naegele & Lamb Co. . . 1204 Hennepin Ave., Minneapolis, Minn.
 Falls Tire Co. of New Jersey 64 Halsey St., Newark, N. J.
 Royal Tire Co. of New York 833 7th Ave., New York, N. Y.
 The Falls Tire Co. 633 N. Broad St., Philadelphia, Pa.
 Costello-Lang Co. . . . 556 Golden Gate Ave., San Francisco, Cal.
 Seattle Tire & Rubber Co. 1624 Broadway, Seattle, Wash.
 McAdams & McCrery Urbana, Ohio



Mr. Dealer—You are "overlooking Big Money" if you don't investigate our proposition on replacing Ford Bevel Gear Differentials with the

Pulls Both Wheels



Stops the "Spin" and the "Skid"

The M. & S. Differential prevents wheel spinning and so lessens wear on tires and minimizes the danger of skidding. The M. & S. transmits all the power to the wheel having the greatest traction instead of to the wheel with the least, and this enables the car to go through mud and deep sand with ease. One wheel cannot travel faster than the other on a straight pull because the M. & S. is virtually a differential lock—yet it automatically differentiates wheel travel in turning corners.

Made by the Greatest Gear Factory in the World

If the manufacturing rights looked good enough for Brown-Lipe-Chapin Co. to put in special machinery, the selling end ought to interest every Dealer, Garage and Supply House. Our book, "Stuck," tells all about the M. & S. Send for it today and get our Dealers' proposition. The M. & S. is standard equipment on the Jeffery Quad.

M. & S. Specialties for Fords
 Modern Safety Steering Device. Price...\$3.00
 Ring and Pinion Gears—Standard Ratio—
 special 3¼% nickel steel. Price.....\$6.50
 Write for Dealer's Discount

M. & S. GEAR CO.

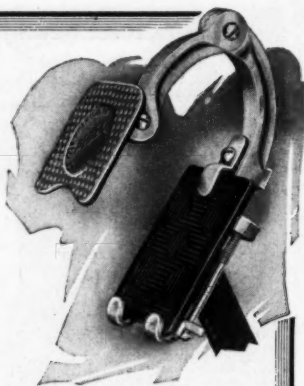
1035 David Whitney Building, DETROIT

Distributors:

M. & S. Sales Co. Dallas, Tex.
 M. & S. Sales Co. . . . Philadelphia, Pa.
 Hill Smith Metal Goods
 Co. Boston, Mass.
 M. & S. Sales
 Co. Detroit, Mich.
 Southern Road Machinery
 Co. . . . Knoxville, Tenn.

M. & S. GEAR CO., 1035 David Whitney Bldg., Detroit, Mich.
 Without any obligation on my part, you may send me your dealer's proposition and your illustrated book describing the M. & S. Differential.
 Name.....
 Address.....

Can Your Wife Drive Your Car?



Attach a pair of **PEDEX** to your permanent Pedals and make it possible for other members of your family to drive your car in comfort and safety.

PEDEX can be adjusted to fit any reach on any car, and in no way do they interfere with the operation of the permanent Pedals.

In ordering be sure to give make of car, year and model

Price (f. o. b. N. Y.) \$5.00 a Pair

DEPARTMENT A

AMERICAN CAR ACCESSORIES COMPANY

30 CHURCH ST.



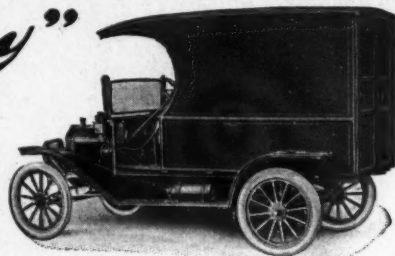
NEW YORK, N. Y.

Liberal terms to dealers

"Henney"

Commercial Bodies

Will Fit Any Regular Ford Chassis

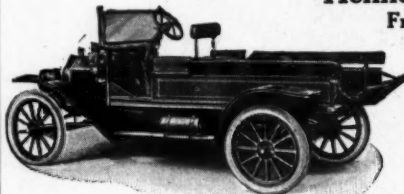


Any regular Ford Car may be easily converted into a delivery car by adding a **HENNEY COMMERCIAL BODY**. Simply lift the body onto the chassis and tighten only six bolts—body can be put on or taken off in a few minutes without the aid of a mechanic, as all Henney Bodies are shipped complete with all necessary bolts and will fit any regular Ford chassis.

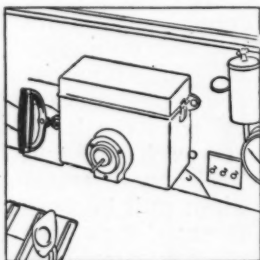
Henney bodies are beautiful in design and built of the best grade of materials throughout.

We have a body suited for every need—general merchant, dry goods merchant, hardware dealer, grocer, plumber, florist, farmer and dairyman. List prices range from \$18.75 to \$90.00. Catalog describing HENNEY Bodies will be sent on request. Write us today.

Henney Buggy Co.
Freeport, Ill.



Dealers:—You will find ready sale for Henney Bodies. Will fit used chassis and help you turn over your stock quickly at a good profit. Ask us for special dealer's proposition. It's a money maker.



Operated from the Driver's Seat. Note Handle Control.

Majestic (Mechanical) Under-the-Hood Starter For Ford Cars

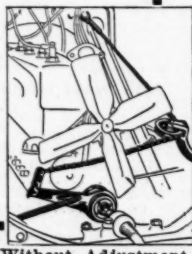
From the driver's seat, operated with one hand, the **MAJESTIC Mechanical Starter** spins the motor of your Ford. Just pull the handle, and push it back. Simplest starting device in operation. Free from complication, like your Ford. Works every time.

Fully Guaranteed

Attaches without adjustments. Crank stays in place. Absolutely backfire-proof. No load on the motor. No delicate electrical connections to work loose. No running expense or upkeep. Attach it yourself, in 1½ hours. First cost only cost—\$9.75. Don't pay more.

**BIG SALES
LIBERAL PROFITS
FOR DEALERS**

\$9.75 Majestic Mfg. & Specialty Co.
1355 S. Mich. Av.
Chicago



Attached Without Adjustment

Schrader



FREE

AIR IS FREE—
Rubber Costs Money—
RIDE ON AIR

When the air in your tires falls below a certain pressure you no longer are riding on air, but on rubber.

Measure your air with a

Schrader

UNIVERSAL TIRE
PRESSURE GAUGE

and save your tires.

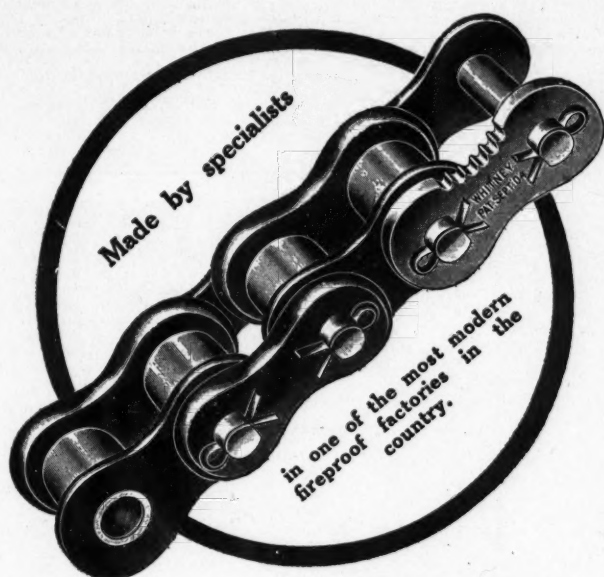
Price, \$1.00

at your dealer's, or

A. SCHRADER'S SON, Inc.
783-793 Atlantic Ave. Brooklyn, N. Y.

"WHITNEY" CHAINS

The Most Practical for Motor Trucks



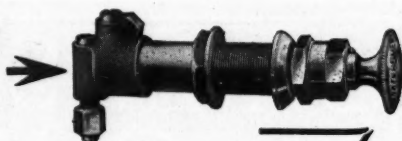
THE WHITNEY MFG. COMPANY
HARTFORD, CONN.

Chains

Keys

Hand Milling Machine

A Timely Device

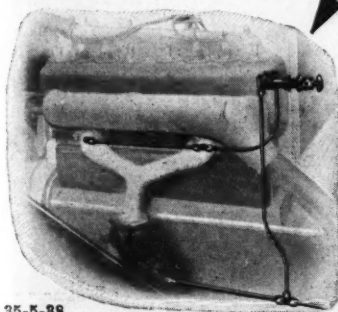


Remember the trouble you had starting your motor during the last cold season?

Now is the time to guard against a recurrence of that annoyance and expense. You can do so by equipping your car with a

LUNKENHEIMER GASOLINE ENGINE PRIMER

Connected within easy reach from the driver's seat—just a stroke of the plunger gives that necessary gasified charge, creating a power impulse on the first turnover.



35-5-88

Save

the battery and eliminate that tiresome and dangerous spinning of motor by hand. Quickly and easily attached to any make of car.

Order from your dealer, or write us

Descriptive booklet upon request

THE LUNKENHEIMER CO.
"QUALITY"

Largest Manufacturers of High Grade Engineering Specialties in the World

CINCINNATI

New York Chicago Boston London
Awarded MEDAL OF HONOR
Panama-Pacific International Exposition, San Francisco, and
GRAND PRIZE Panama-California Exposition, San Diego.

When Writing to Advertisers, Please Mention Motor Age

Look at
the palm
of this glove



Style
4827
\$3.00

The secret of a sure grip lies in the double-corrugating—you get a firm grasp on your steering wheel that holds regardless of the speed of the car, or the bumps and sharp curves you encounter. For safe motor driving, wear

Grinnell Gloves

"Best for every purpose"

They protect your hands from the cold, too. Every style is warmly lined, and the roomy cuffs keep out the biting winds. Yet your fingers are free to make adjustments of the motor, tires, etc.

Dressy and Serviceable

Grinnell Gloves are the finest gloves you can wear—and the most serviceable. They are made of the highest quality Colt and Reindeer leathers—soft and pliable, yet wear like rawhide. They'll far outlast other gloves.

Easy to keep clean

You never worry about soiling Grinnell Gloves—they can be easily washed in soap and water or gasoline. When dry, they are every bit as soft and smooth as when new.

Many exclusive features

You'll find more exclusive features on Grinnell Gloves than any other. "Elast-Fit" keeps the cuffs in place. "Ventilated Back" lets in air but keeps out dust and dirt. These features add to your comfort—but cost you nothing extra.

The guaranteed gloves

We guarantee Grinnell Gloves not to crack, peel, shrink or harden from ordinary usage. They will please you in every way.

Get a pair of Grinnell Gloves on approval

If your dealer cannot show you Grinnell Gloves, send us his name and your size, and we will send a pair on approval. Catalog and leather samples sent free on request. Write for them.

Morrison-Ricker Mfg. Company

(Established 1856)

64 Broad Street

Grinnell,
Iowa



Dario Resta, the sensational winner of Chicago Speedway Races, wears the famous "Limp-Kuff."

Absolutely Waterproofed



No matter how cracked or full of pin holes your top is, you can make it absolutely waterproof for a whole season by applying

MANSFIELD'S NEVER-LEAK WATERPROOF DRESSING

Contains no varnish, shellac, oil or asphaltum so that it makes the fabric more flexible and durable.

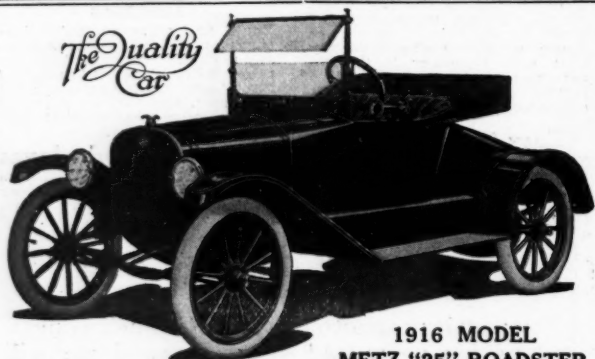
Water positively cannot penetrate or even get a foothold on a fabric treated with Never-Leak. It sheds water as easily as a duck's back. This dressing being colorless, fabrics undergo no discoloration.

Silks, cottons or other fabrics made waterproof without stain or stiffening.

If your dealer doesn't sell Never-Leak, send us his name or write direct. Put up in ready-to-use cans, quarts, \$1; half gallon, \$1.75, and gallon, \$3. Quart will cover roadster top and half gallon will cover 5-passenger touring car top.

MANSFIELD MFG. CORPORATION
824 S. Clinton
SYRACUSE, N. Y.

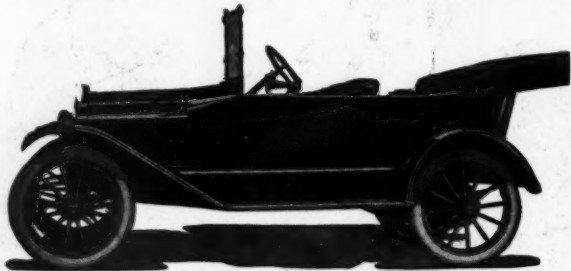
"Water rolls off like off a duck's back."



METZ

1916 models. Price, \$600 each, completely equipped. Both Roadster and Touring Car built on same chassis, 108-inch wheel base, and carry identical equipment, including electric starter and electric lights, 25 h. p. water-cooled motor, large wheels and tires, rain vision wind shield, instant one-man top, speedometer, built-in gasoline gauge, signal horn, etc. Write for DEALER particulars and new illustrated catalog "K."

METZ COMPANY, Waltham, Mass.



1916 MODEL, METZ "25" TOURING CAR

THINK OF THIS:

The exhaust of a "forty" would heat an eight-room house!

THE "AUTO-RAD"

is a radiator for automobile heating. It consists of an unobtrusive enameled steel casing (see illustration) which covers a specially designed radiator which promotes a gentle circulation of warm air under the rugs, about the feet and body. It adds only four pounds to the weight of the car, costs nothing for upkeep or fuel and fits into an unused space and becomes part of the car itself. It is quite impossible for any exhaust gas or road dust to get through the radiator into the car. It is clean, odorless, durable and attractive in appearance. The "AUTO-RAD" can be finished to match any upholstery and really adds to the appearance of the car. Price \$6.00, Ford Model. Regular Finish, Black Enamel. Special Finishes and Closed Cars extra.

BREVANDO MFG. CO.

520 Arlington Bldg.


Rochester, N. Y.



SIMMS ^{High Tension} MAGNETO and SIMMS-HUFF Electric Starting and Lighting System

Automobile Engineers unite in pronouncing Simms Products "Electrical Equipment Par Excellence."

The SIMMS MAGNETO Co.
East Orange, N.J.



DETROIT SELF-LUBRICATING CUPS

ARE SILENT
The Self Lubricating Cups prevent squeaking—insure smooth action

DETROIT SELF-LUBRICATING CUPS
Detroit, Mich.



**1916
Light Six
"40"**

\$1095

Compare These Features with Those of Other Cars

SO WE ask you, in the light of your knowledge of automobiles, to judge the Glide strictly on its merits. The specifications will help you—but better still, see the car—ride in it—drive it. Then compare it part by part with other sixes of the same class and size, and when you have done this, compare the price. In the new Glide Light Six "40" you will find the true yacht-like streamline body—unbroken lines from the headlights to the rear tonneau.

Roomy Tonneau. Flush Type Doors and Concealed Hinges. Superb Finish. Genuine High-Grade Enameled Leather Upholstery. Goodyear Demountable Rims. Goodyear 34x4 No-Rim-Cut Tires—Non-Skid on Rear Wheels. Rutenber High Duty Motor, Six Cylinder, 3x5. 12-Plate Dry Multiple Disc Clutch. Spicer Dust-Proof Self-Oiling Universal Joints. Tubular Propeller Shaft. Spiral Bevel Driving Gears. Pressed Steel Rear Axle Housing. Brown-Lipe Differential. Hotchkiss Drive. Crowned Fenders. Rim Type Tire Carrier.

Unit Power Plant. Two-Bulb Headlights—Conforming with City Ordinances for Dimming. Linoleum-Covered Runboards. Storage Battery Under Footboard. Brown-Lipe Transmission—Aluminum Case. Stewart-Warner Vacuum Gasoline Feed System. Westinghouse Ignition System. Westinghouse Starter, Bendix Drive. 18-inch Corrugated Walnut Steering Wheel. One-Man Top. Jiffy Curtains. Rain-Vision Windshield—Integral with Body. Wheel Base, 119 Inches. Weight, 2600 Pounds. Price, \$1095, f. o. b. Peoria.

The Bartholomew Co., 215 Glide St., Peoria, Ill.

EISEMANN

MAGNETOS

Are Now Used by

107 Manufacturers

Including the largest in the country, and embracing

71 Trucks
11 Pleasure Cars
25 Miscellaneous

Tractors, Mining Machinery, Stationary Engines, Gasoline Locomotives, etc.

The Reasons Why

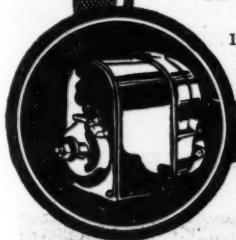
are found in the magnetos themselves!

The Eisemann Magneto Co.

Sales and General Offices

32-33rd Street, Brooklyn, N. Y.

New York, 245 West 55th Street
Indianapolis, Ind., 415-417 N. Capitol Ave.
Detroit, Mich., 802 Woodward Ave.



**\$15
for a
Set of
FOUR**

The Price

of the



Shock Absorber For Ford Cars

In comparison with the high quality of workmanship, efficiency in giving perfect riding comfort, easy steering and safe driving, is so low that many men have said, "I don't see how you can sell them for that price."

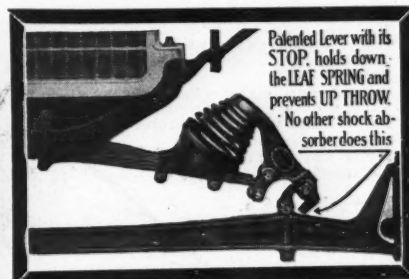
The Hassler at \$15 gives you greater value, in durability of construction, efficiency in operation and economy in tire saving, than any other shock absorbers at any price.

Dealers—You can sell the Hassler. Hundreds of dealers are adding profits to their business. We want to send you a trial set. Not sold through jobbers. We protect you. Don't delay—write today for our liberal selling plan.

**ROBERT H.
HASSLER**

Inc.

Indianapolis,
Indiana



Guaranteed for 10,000 Miles



BRICTON Pneumatic Tires are guaranteed for 10,000 miles and under a specific 10,000 mile written service guarantee. What more can you ask of a tire? With Bricton Tires, punctures, blowouts and rim-cuts are eliminated—they are proof against ruts, oil and gasoline. Resilient and easy riding, too.

Try Them at Our Risk

Give Bricton Tires a free trial on your own car. Put them to test at our expense. Find out why Bricton Tires sales are increasing daily.

Your Tires Rebuilt the Bricton Way

If the fabric in the tires now on your car is in good condition, we can take them and make them proof against rim cutting, punctures, blow-outs, sidewall breaks, skidding, ruts and oil and give you thousands of miles of additional service.

Write today for full information about Bricton Tires. Tire Rebuilding and details of our liberal Free Trial Offer.

THE BRICTON MFG. CO.

12-115 Bricton Bldg.,

Brookings

South Dakota

Bricton Pneumatic Tires

The Man Who Uses Your FREE AIR Buys Your Gasoline, Oils and Supplies

Drivers who use your free air station, use it for convenience. And for convenience, while they're there, they buy gasoline, oil and supplies from you.

MAYO ELECTRIC GARAGE PUMP

—pays for itself in new customers. The most convenient and economical free air apparatus in use. Operated by $\frac{1}{4}$ h. p. electric motor, with silent chain drive. Water cooled. Automatic auxiliary tank air-pressure system. Entire equipment set on portable oak base.

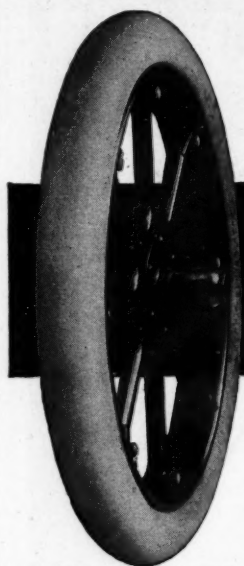
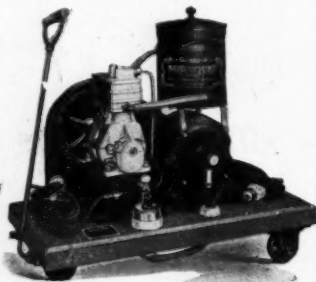
Complete, with 10 ft. electric wire and separable attachment plug, 12 ft. high grade rubber tubing, accurate pressure gauge and tire valve construction, holders for wire and hose.

In ordering state whether alternating or direct current, 110 or 220 voltage motor is required.

Write for free folder and special discounts.

\$75

Mayo Mfg. Co.
54-60 E. 18th St.
Chicago



Dealers Know when they see the real thing
That is why they're wiring for full details of

PARKER-HYDRAULIC Pressed Steel Wheels for FORDS-\$19⁷⁵ SET OF FOUR

They know that these wheels will sell quickly because they give the motorist

1. Absolute safety due to great strength.
2. Ease and quickness of tire change, because they have the quickest and easiest demountable rims.
3. A saving in tires and gas due to light weight.
4. A lasting and durable, baked-on finish that's easily kept clean and non-rustable.

Let us tell you all about these wheels. Let us show you why they are the best proposition for live dealers. Write or wire for full information.



The Hydraulic Pressed Steel Co.

3170 E. 61st St., Cleveland, O.

Builders of "Hydraulic" Pressed Steel Frames on which Reliable Cars are Built



Wisconsin Motors

World's Champions on Road and Speedway

The same power, stamina, endurance, that enabled Wisconsin Motors to defeat the most famous European motors and made them champions of the world in road and speedway racing, make them the most consistent motors for pleasure cars or trucks.

WISCONSIN MOTOR MANUFACTURING CO.

Station A, Dept. 311, MILWAUKEE, WIS.

TWENTY FIVE FEET OF GINGER-

"Gingery" is a good term to describe Basline Autowline. This "nervy" little tow-rope-wonder is of tough, elastic Yellow Strand Power-steel wire rope. That's why

BASLINE AUTOWLINE

stands such an everlasting amount of pulling and hauling. "Autowline" fastens quickly with patent, hold-fast snaffle hooks and unfastens just as quickly—when you want it to. Never scratches paint or varnish. If you don't own an "Autowline," beat it to the dealer before bad luck gets you. Easily slips under a seat cushion or anywhere else out of the way. Price, east of Rockies, \$3.95. POWERSTEEL TRUCKLINE is Basline Autowline's "big brother," for heavy towing. A necessity on every commercial truck. Price, east of Rockies, \$8.50. If your dealer can't supply you, order direct. POWERSTEEL AUTOWLOCK is your protection against auto-thieves. Four feet of 1/4-inch yellow strand wire rope with devices at each end through which a good brass lock slips and locks fast. Secures wheel to spring or spare tire to rack. Can't be cut or broken with hand tools. Price \$2.00.

FREE Handsome Circulars. Write for them.

Broderick & Bascom Rope Co.
813 N. 2d St., St. Louis, Mo.
N. Y. Office, 76 E. Warren St.
Makers of famous Yellow
Strand Powersteel
wire rope

Has saved
thousands of lives

Watch Your Brake Lining

Unless the brake lining on this brake band is *right*, all of your starters, fine motors, pretty equipments and varnished bodies are likely to end on the junk pile.

Some brake linings are *not* right. They have merely a friction skin and the stringy core is worthless for gripping or braking purposes.

Thermoid is brake lining clear through.

It holds though worn paper thin. That is because it is cured under hydraulic compression into a solid substance of uniform density. Take no chances—guard your safety with Thermoid.

Thermoid Rubber Company

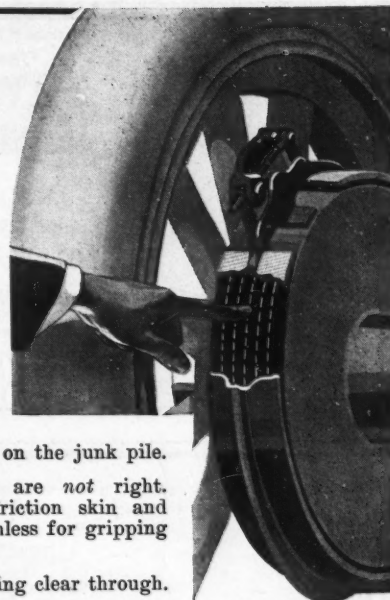
TRENTON, N. J.

Our Guarantee: Thermoid will make good or we will

Thermoid
HYDRAULIC COMPRESSED
Brake Lining - 100%



Cannot be burned out nor affected by oil, heat, water, gasoline, dirt.



The Kicks and Worry of
the Roughest Roads are
Smoothed Out with



Road Smoothers

QUICKLY applied to your Ford Car



\$15 Set of
Four
One for Each Wheel

Thousands and thousands of motorists are getting smooth, comfortable riding regardless of the road's roughness by equipping their light, economical Fords with K-W Road Smoothers. They do this because their design combines these four vital features—A spring to effectively take up the shock; an anti-rebound air chamber to check rebound, and anti-side-motion links to prevent rocking and swaying—and a construction that absolutely does not interfere with the steering.

Sold by reliable dealers everywhere. Write for illustrated booklet, "That Satisfied Feeling."

THE K-W IGNITION CO.
2835 CHESTER AVE. CLEVELAND, OHIO, U.S.A.

Manufacturers of the 125,000 K-W Master Vibrators

A Profitable Source of Revenue
for the Garage or Dealer

Battery charging will show you a big profit and at the same time will draw other business to your garage or store.

With the new

Robbins & Myers Battery Charging Set

all you need do is attach the terminal clips to the battery and turn on the motor switch; the charging set does the rest. When the battery becomes fully charged, the generator will float on the line without injury to the battery.

The prices of the sets range from \$42.00 up. Write for descriptive circular

THE ROBBINS & MYERS CO.
Springfield, O.

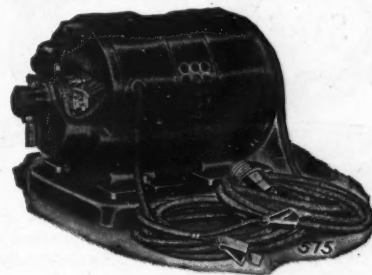
New York
Cincinnati

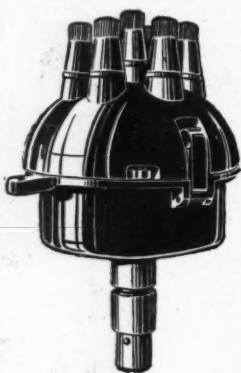
Boston
Chicago

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San Francisco





The Atwater Kent Ignition System

Used by one-quarter of all 1915 U. S. A. built cars, exclusive of Fords.

4934 STENTON AVENUE
PHILADELPHIA, PA.

The Correct Upholstery for Touring Cars is



a woven textile designed and constructed to meet all the requirements and abuses of touring car and convertible body upholstery. "MOLEX" should not be confused with ordinary cloth upholstery, such as is used in limousines, electric cars or horse drawn vehicles.

We have prepared an instructive and interesting booklet describing in detail the features and ad-



vantages of "MOLEX" Upholstery for touring bodies. We will send this booklet if you request it.

FREE!

Motorists, send and get your copy of our tire book—

"Care and Repair of Tires"

It is a guide and text book that will post you thoroughly. It tells the proper inflation according to weight, load and season. It describes fully how to protect the tires while car is idle in the garage—how to care for them in winter—how to avoid substances that rot the rubber and fabric. It gives splendid hints on the spare tire and its care—how to carry extra tubes. It explains the tire sleeve, the blow-out patch—repair plasters and plugs and emergency or temporary repairs. This book is quoted as an authority by American and Foreign Automobile Publications, because of the authentic information it contains. It's free to any motorist. No obligations. Just write and we will send it to you without cost.

C. A. Shaler Co. 245 Fourth St. Waupun, Wis.



GENEMOTOR

For Starting and Lighting FORD Cars

Built By The

GENERAL ELECTRIC COMPANY

A. J. PICARD & CO.

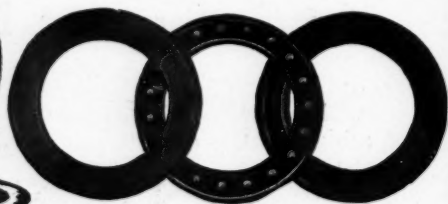
1720-22 Broadway

Sole Agents

NEW YORK

The Bearings Company of America

Sales Department, 250 W. 54th St., New York



COMPLETE THRUST BEARING



RADIAL RETAINERS

Manufacturers of Star Radial Ball Retainers, Star Ball Thrust Retainers, Star Complete Ball Thrust Bearings



22-72 Touring

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Runabout

Raceabout

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Trenton, N. J.



Be the Biggest Tire Dealer in your Town:

THE MILLER DEALER!

The Miller method of building Tires means satisfied Users. The Miller Method of selling (one dealer in your town) INSURES your profit.

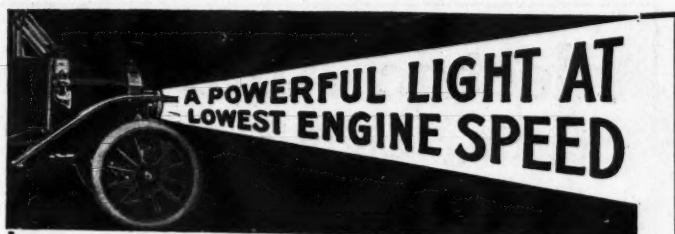
Write for our plan.

THE MILLER RUBBER CO., Akron, O.

Corcoran Lamps

GAS, OIL, AND ELECTRIC

CORCORAN LAMP CO.
CINCINNATI, O.



The New York
Automatic Head Light Controller
for Ford Cars

Delivers a Powerful Light at the Lowest Engine Speed

Price \$5.00 Complete

This is positively the only device on the market that has solved the problem of operating electric lights satisfactorily from the Ford fly wheel magneto.

ATTENTION, DEALERS—Our new catalog with 1916 prices is now ready. Our line covers the Famous Rhoades Battery Ignition System, Master Vibrators, UNI-COIL Ignition System, and many other rapid selling accessories for the Ford cars.

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337 Pearl Street, New York City
WESTERN BRANCH. 1461 Michigan Ave., Chicago, Ill.

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Model U, 2 3/4 x 4 Model C, 4 1/2 x 5 1/4
Model N, 3 1/2 x 5 Model E, 4 1/2 x 5 1/4
Model N, 3 3/4 x 5 Model T, 5 x 5 1/4
Model C, 3 3/4 x 5 1/4 Model T, 5 1/4 x 5 1/4

Models—SIXES
Model 7 W..... 3 1/4 x 4 1/4
Model 7 N..... 3 1/4 x 5 1/4
Model 6 P..... 3 1/4 x 5 1/4

CONTINENTAL MOTOR MFG. COMPANY
DETROIT, MICH.
Factory Representative, K. F. Peterson,
122 S. Michigan Ave., Chicago.

The Hartford
SHOCK ABSORBER
Makes ROADS LIKE THIS
FEEL LIKE THIS

Stops jolting, jarring and vibration. Eliminates side sway. Contributes to solid auto comfort. Prevents spring breakage. Makes tires last longer. Cuts cost of maintenance. Insures longer life for your car. Complete literature on request. Write mentioning make, model and year of car and we will advise how to equip to secure genuine comfort. Your new car will be Hartford-equipped if you insist.

HARTFORD SUSPENSION CO.
E. V. Hartford, Pres. 146 Morgan St., Jersey City, N. J.
*Formerly Truffault-Hartford Shock Absorber.

For Leaky Cylinders

Superior to All Others



PATENTED AUGUST 6, 1912

A Piston Ring Which Gives Compression in "Out-of-Round" Cylinders as Perfectly as in True Ones



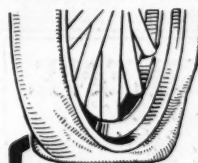
Here is a piston ring that gives 100% efficiency to every type of motor, engine, compressor or pump.

Ideally adapted to use in Automobile and Motorboat engines. Gives compression when all others fail. No need to rebore worn cylinders—simply install EVER-TIGHT piston rings and the motor is good as new.

EVER-TIGHT piston rings are made up of three individual, interlocking rings, grooved together to give flexibility and reduce friction. This three-part construction is clearly seen in illustrations above. This is the only perfect three-piece piston ring on the market.

If dealers do not carry EVER-TIGHT piston rings, Auto repair men should write us. Jobbers and dealers wanted everywhere. Write for particulars.

THE EVER-TIGHT PISTON RING CO.
1432 CHESTNUT STREET ST. LOUIS, MO.



NO MORE FLAT TIRES

NO matter how strong the guarantee on pneumatic tires, it doesn't prevent the blow-out. It doesn't help you when your tire goes flat. You must get out and change tires or patch the old ones.

But here's a different tire, neither solid nor pneumatic. It's as puncture-proof as a solid tire and as easy riding as a pneumatic.

DAYTON AIRLESS TIRES

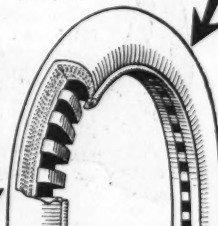
are a big, positive success. They wear 'till the tread is completely gone. Need no pumping nor patching. Five to eight thousand miles of uninterrupted mileage guaranteed. Users commonly get ten to twenty thousand miles.

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Get the real facts about Dayton Airless Tires. Read the letters from users.

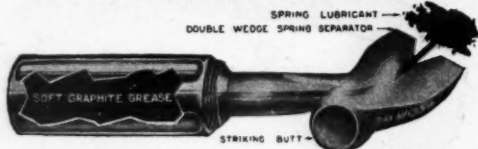
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Tomahawk Spring Lubricator

Will Increase the Comfort of Riding in Your Car 100% and Stops the Squeak



The simplest, quickest and most effective tool on the market for spring lubrication. Made of the finest drop-forged steel, hardened and nickel plated. Graphite grease is fed from the container in handle. One blow of the hammer, a twist of the wrist, and the trick is done.

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Electric Auto-Lite equipment for automobiles is as famous for the service that backs it as for the reliability and economy of its operation.

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HEINZE

High Tension Magneto

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Better Material
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HEINZE ELECTRIC COMPANY

THE POWERFUL, SILENT SPHINX

Model B-16 \$640

A REAL AUTOMOBILE

The lightest, strongest, most serviceable and economical machine of its kind ever built.

112 inch wheel base. Electrically started and lighted.

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MIDGLEY PATENTED TIRES

Wire Tread

Plain and Non-Skid
Inner Tubes

Unexcelled—Write for
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KISSEL KAR

The new designs of the ALL-YEAR Car include a Detachable Coupe Top at \$300 as well as a Detachable Sedan Top at \$350.

Write us about the new touring models, the 32-Four at \$1050, the 36-Four at \$1250 and the 42-Six at \$1450—three great values. Literature ready.

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The ALL-YEAR Car

JUMBO SPARK PLUGS

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| Jumbo Jiant \$1.25 | Jumbo Regular \$1.00 | Jumbo Junior \$0.75 | Jumbo Special for Fords \$0.75 |
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NEW BULL DOG
NON-SKID TIRE

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GREATER MILEAGE**

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A mixture ignited by **two plugs at once** burns almost instantly. Power and gasoline mileage are greatly increased, carbon is reduced, and spark manipulation almost eliminated. **SU-DIG Series Plugs** are specially made to work in connection with the regular plugs. They soon repay their cost in fuel saved. A valuable aid in cold-weather driving and with low-grade gasoline.

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Salemen wanted to carry SU-DIG Plugs as a side line.



Provided
with or without
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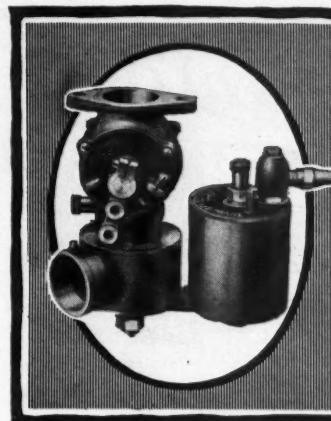
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The Carburetor of the New School completely automatic without the use of springs, balls, cams or auxiliary valves

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NON-FLUID OIL insures the transmission of all the power developed with the least friction and with the least wear. It lasts 3 to 4 times longer than LIQUID-oils, or greases; hence is most economical.

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"K No. 00 Special" grade for slid- | "K No. 000" for differential, com-
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REXON II
\$3.85—Ready to Attach
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Over 1,000,000 Fords now in daily use—should be evidence enough to any prospective buyer of the stability, quality and general popularity of this universal car.

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\$3.00
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Savings made please your patrons and pay good substantial profits.

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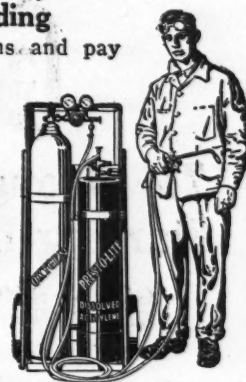
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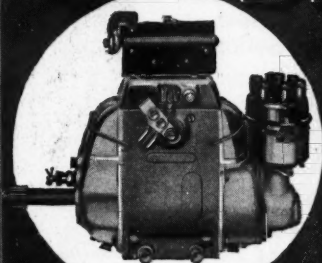
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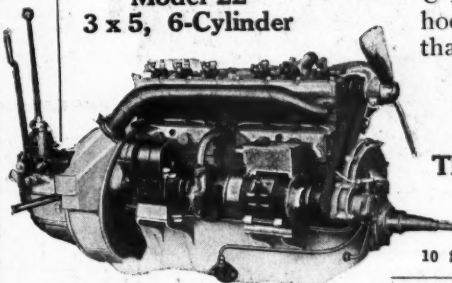


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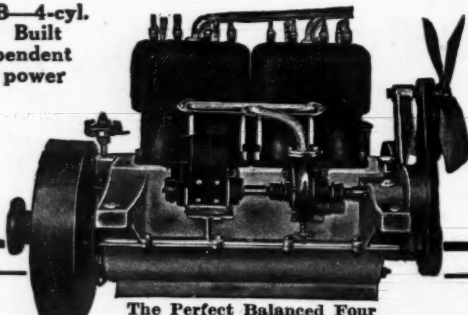
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4½x5. Built
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The United States Motor Truck Co.
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FLEXIBLE and DURABLE
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Made in 2, 2½, 3 and 4 Ton Capacity

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Write for details and let us tell you why so many manufacturers are adopting this carburetor as standard equipment.

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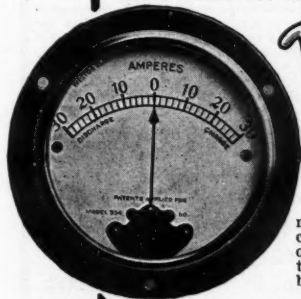
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after your Electrical Equipment breaks down, to avoid the delays and expense of repairs. But your lights and starting motor would not have failed you if you have installed a



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With a Weston Ammeter you have a reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working, and that the storage battery is receiving its proper charge.

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Built for Trucks Exclusively

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The fact that Blood Bros. Joints have been used on some cars as a regular equipment for ten years speaks well for them. There is a reason.

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"It leads the leaders"
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50% Reduction in List Price
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Detroit Batteries are proven best by the tests of engineers—first in capacity, first in capacity for weight, first in reliability. Boxes are finest woods. Cells are tested with 30,000 volts, acid thoroughly tested, and water distilled in our own plant to insure purity.

There's a Detroit Battery to Fit Every Starter and Every Car.

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One 48 H.P. Pierce Arrow, five passenger, late 1915 Touring Car. Absolutely brand new condition—paint and mechanical. Seat Covers. Price \$4000. Run 2400 miles.

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Complete with top, top hood, side curtains, floor boards, mat, rear fenders, side and rear lamps, hood support and dash, rear fenders, and windshield.

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Roadster, Touring and Speedster Bodies upholstered\$35.00 to \$5.00
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Special discount for quantities and for cash.

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We manufacture tapered axles for Fords of a particularly tough steel and are the only manufacturers who guarantee that the axles for Fords which we furnish will not crack out in the keyseats for a period of one year, each axle being stamped with the date at time of shipment.

Price, \$2.50 Dealers, regular discounts. We also manufacture Spring Radius Rods, Radiator Cradles, Kant Kum Off Belt Holders, and the celebrated "Angiers Spare Demountable Wheel" for the Ford car.

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Model T honeycomb, V-shaped, for Ford..\$22.50
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Every radiator guaranteed against imperfect material and workmanship, and shipped in special radiator boxes.

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**Wire Forming and Pointing
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| 36x4 Firestone S.S. rims..... | 2.30 |
| 36x4 Firestone clincher rims..... | 2.30 |
| 34x4 Firestone S.S. rims..... | 2.30 |
| 32x3 1/2 Baker S.S. rims..... | 2.30 |
| 36x4 Standard rims..... | 2.30 |
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| 36x4 Baker wheels (many types)..... | 3.00 |
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| Wire wheels for Ford cars—complete with hubs and bearings, per set..... | 12.00 |
| Allowance of \$2 per set for old wheels) if sent us prepaid. | |
| Radiators for Fords—Model "T" honeycomb, upwards of..... | 17.00 |
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| Brand new touring car and roadster bodies, for Ford cars, complete with tops, windshields, 3 oil lamps, floor mats and rear fenders, for roadster..... | 65.00 |
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| 6-volt lighting generators, each..... | 10.00 |
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We make a specialty of regrounding
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| One new 4-cyl. 12 H. P. motor..... | 75.00 |
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Above are used motors, guaranteed to be in good shape. Will take other motors in on trade

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Can supply you with Crank Cases, Crank Shafts, Cam Shafts, Cylinders, Pistons, Connecting Rods, Radiators, Gears (any style), Timers, Magnets, Colls, Carburetors, Manifolds, Water Pumps, Transmissions, Rear and Front Axles, Wheels, Steering Gears (complete), Steering Wheels, Gasoline Tanks, Wind Shields, Springs, Bodies, Seats and Cushions, Jacks, Tires and Tubes, Head Lamps, Side Lamps and Tail Lamps (any style), Prest-O-Lite and Search Light Tanks, Horns, Mufflers—in fact, any part of an auto.

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We also buy old autos—condition no object—or any part of an auto, or if you want to trade parts we will trade with you.

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Old Church, 13th and Oak
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WANTED

To buy four and six cylinder motor separately or old cars with serviceable motors in them. Please give best cash price and full description in first letter.

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Half list price. Used. Good as new. Sent C. O. D. privilege of inspection. Write for list of parts on hand. E. A. BARNES, 305 PATTERSON BUILDING, OKLAHOMA CITY, OKLAHOMA.

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A New Radiator or Your Old One repaired. Repairs in one day—a new radiator in two days. We are specialists also on fenders, hoods, gas tanks, lamps and all auto sheet metal work.

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of the Highest Quality. By dealing directly with Radiator Manufacturer save from 30% to 50% on new radiators and cores. Write for prices.

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RADIATORS REPAIRED

Any make or style. We are specialists and guarantee satisfaction. Out-of-town orders receive prompt attention.

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RADIATORS REPAIRED
Leaking and wrecked radiators made equal to new. New cores or any part fitted in any radiator. Hoods, Fenders, Tanks made to order. **GUARANTEED WORK—QUICK SERVICE**
Write for prices. Phone Haymarket 4037

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Have stood the test of years—most durable and efficient. Get the best at less cost than others. Don't order until you send for our prices, and illustration of construction. Honeycomb and Bridge Fin Types (tubular). All standard makes in stock. Exceptionally low prices on Fords. Dealers' discount.

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Butler's Special Alloy Pistons

Are durable, and stronger than cast iron. Cylinder grinding, cast iron or alloy pistons, piston pin bushing, standard and oversized valves. Quality work is our motto. Write today.

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Crankshafts, Crankcases, Connecting Rods, pistons, scored cylinders made equal to new with our New Silver Iron process—use the same piston and rings.

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Either cast iron pistons and rings or our special light alloy pistons and rings furnished. State make of car in writing.

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on automatic machinery by skilled mechanics at prices that will interest you. Gears, axles, valves and parts of all kinds made of high grade alloy steel. Send us your worn or broken parts and we will replace them.

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Special Light Alloy Pistons

Our special facilities enable us to do highest grade work. Over 225 piston patterns.

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And fitted with new pistons and rings—any motor. Oversize valves and piston pins and bushings. Everything for the Automobile motor. We are specialists and guarantee first-class work. The best equipped Automobile Repair and Machine Shop in Southern Indiana.

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Fitted with light cast iron pistons and McCadden leakless rings, new pins, bronze bushing. Weight of Buick 10, 1½ pounds, Ford, 1½ pounds, Hudson 33, 2½ pounds. Absence of vibration, quiet, smooth. Any make car.

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Fitted with my heat treated light weight pistons and patented three section rings.

From \$6 to \$15 per Cylinder
Ford cylinders reground, fitted with new piston rings, wrist pins and bushings for \$20.00.

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Including new pistons and rings, \$7 to \$11 per cylinder. General overhauling and repairing. Welding, Cylinders, Crank Cases and Crank Shafts welded.

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All Makes of Automobiles, Motorcycles, Stationary and Tractor Engines Rebored and Fitted with Special Oversize Pistons and Rings.

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Pioneer Cylinder Reborers and Specialists
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Cylinders Rebored at ridiculously low prices

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| 1 cyl..... | \$15.00 |
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Prices include new piston and rings.

Work Guaranteed.

Money refunded if not satisfactory.

Work Promptly Done.

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and fitted with Special Composition heat-treated rings and heat-treated pistons, \$7.00 to \$15.00 per cylinder. Ford cylinders reground and fitted with Standard weight pistons, \$18.00. Special light pistons, \$24.00. Oxy-Acetylene Welding.

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Including new pistons and rings for \$5 to \$11 per cylinder. We do this class of work exclusively and are thus able to give you the highest class of work at these prices. Ford cylinders reground, including new pistons, rings and wrist pins, for \$20.00.

THE CROWN MACHINE SHOP
Crown Point, Ind.

LEE W. OLDFIELD

Minneapolis, Minnesota
Extra light reciprocating parts and accurate cylinder grinding my specialty.

SPECIAL PISTONS FOR FORD CARS

That enable you to carry a gallon more oil in your crankcase. We positively guarantee oil will not soot your spark plugs. Cylinders reground. Pistons made and fitted. General machine shop work.

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WE THOROUGHLY OVERHAUL

TRUCKS AND PLEASURE CARS
REBORING OF CYLINDERS, furnishing new pistons and rings at lowest possible prices. **SCORED CYLINDERS** repaired by our electric process and thoroughly guaranteed. **WELDING OF CYLINDERS**, crank-cases and all parts of cars. We are automobile specialists. Write for booklet.

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WE REGRIND CYLINDERS

Furnish our heat treated piston rings and pistons. First class equipment, 15 years' experience. Write for our prices.

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The Clearing House—continued.

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A.A.A.A.—STOP THAT LEAK—A.A.A.A.

It's the waste oil burned into carbon that causes leaky valves, smutty plugs, waste of oil and gasoline. "No-Leak-O" Piston Rings control the oil. Write for trial offer. Automobile Accessories Co., 816 W. North Ave., Baltimore, Md.

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For all makes of cars. Sit right down and write for our samples and price list

Best Materials High Class Workmanship
We maintain a separate department for repairs

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Beat Jack Frost To It Prepare for Cold Weather

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| Rutger robes each..... | \$ 2.75 |
| Rosemary robes, each..... | 4.50 |
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| Foot warmers, each..... | 1.00 |
| Radiator covers, for Ford, each..... | 1.00 |

Complete line of robes and radiator covers. Write for quotations.

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| Motor-driven electric horns, each..... | 5.50 |
| Side oil lamps, per pair..... | 3.00 |
| Demountable wheels complete, for Ford, per set..... | 12.50 |
| 32x4 New casings, each..... | 12.00 |
| 34x4 1/2 S. S. used casings, each..... | 6.00 |
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| Coil to fit same, each..... | 8.50 |
| Justrite tire tools, each..... | .45 |
| Rajah spark plugs, 1/2", each..... | .60 |
| SureFire spark plugs, each..... | .20 |
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Save \$25 to \$75 by doing the work at home with the Arsenal system. Our big free booklet, "The Car Beautiful," tells how. Send for it today.

Arsenal Varnish Company
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The following are just a few of the many accessories. We can save you money—our money-saving bargain sheet just out. Send for one. Complete set shock absorbers for Fords.

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| List price \$15.00; sales price..... | \$ 2.75 |
| Lamps, all types..... | .75 up |
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| One-Man Tops..... | 21.00 |
| Complete with JIFFY Curtains..... | |
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| Our Limousine Tops for Ford Cars..... | 77.50 |
| Our Guaranteed Quality Tires Save You 30% | |

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14th & Michigan Ave. Chicago

Cocoa and Carpet Mats, Hand Made Seat Covers, Auto Tops Built and Repaired AUTO CAPE TOP CO.

2334 Michigan Ave. Chicago, Ill.

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to charge from A-C circuit 1 to 8 ignition, lighting or starting batteries at one time; \$12 and upwards. AMERICAN BATTERY CO., 1124 Fulton St., Chicago.

Reduced Prices on Supplies

Desirous of cleaning up a few lots we have on hand, therefore will offer them at specially reduced prices.

Call and look over our stock. We have the most complete "Automobile Plant" for retail business in the world. Everything from a cotter pin to a complete car.

A Few of Our Specials Are:

1-Man Tops (all years), \$25.00; Windshield, \$8.00; Self-starter, \$6.50; Shock Absorbers, \$3.85 (set); Tool Boxes, 75c and up; Speedometers (Stewart), \$6.45; Sloping Hoods, \$8.00; Lamp Sets, \$4.25 up; Demountable Rim Sets (painted or natural wood), \$12.50; New Runabout bodies, \$35.00; Carburetors, \$5.00 up; Remy complete dual system magnetos, \$25.00; Splittorf, \$17.25; Bearings, \$1.00 up. (Bring in old one and we will duplicate at a great saving). Electros Horns, \$1.60; Rims, all kinds and sizes, at a big reduction; Electric Lamps, \$5.60 pair; Windshields, \$9.00; Spark Plug Pumps, \$3.75; Prestolite Tanks, \$7.00; Pyrene Fire Extinguishers, \$5.50; Lap Robes, \$1.85; Gloves, \$1.00; Spark Plugs, 15c; Wrenches, 8c up; Clocks, 90c; Mirrors, 60c; Storage Batteries, \$7.00; Fur Coats, \$15.00; Tops, \$15.00; Sweaters, \$2.00; Trunks, \$5.00; Dashboards, \$1.00; Runabout or Racing Seats, \$8.40-16.00; Wheels, \$1.00; Bodies, \$35.00; Transmissions, \$20.00-45.00; Axles, \$10.00.

MOTORS, FRAMES, STEERING GEARS, WHEELS AND SPRINGS FOR ALL CARS.

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WORLD'S LARGEST DEALERS

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GUARANTEED TIRE SPECIALISTS

Standard guaranteed tires at attractive prices. Write for price on make of tire desired.

Experts on Tire Repairing

A GREAT TIRE AND TUBE SALE

100 makes, 15,000 tubes and shoes. New and A1 stock. At ridiculously low prices. Saving from 40% to 70%. Cheapest house in the city.

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| Size | Used | New | Size | Used | New |
|---------------|--------|---------|---------------|---------|---------|
| 30x3..... | \$4.50 | \$ 6.00 | 34x4..... | \$ 8.00 | \$12.00 |
| 30x3 1/2..... | 6.00 | 7.80 | 34x4 1/2..... | 10.00 | 17.00 |
| 32x3 1/2..... | 6.00 | 7.00 | 36x4 1/2..... | 10.00 | 17.90 |
| 32x4..... | 9.00 | 11.85 | 37x5..... | 12.00 | 21.00 |

10% deposit with order, balance C. O. D. subject to examination

This Week Only

200 32x3 1/2 Straightside Plain Tread....\$6.75 ea.

ACME TIRE AND REPAIR CO.

1547 Michigan Ave. Chicago, Ill.

BE WISE — SAVE MONEY

on Your TIRE BILLS by Using Our DOUBLE SERVICE TIRES

For full particulars and price list address

I. JAFFESS

1319 Fifth Ave. New York City
Branch at 282 Halsey St., Newark, N. J.

DOUBLE TREAD TIRES

We take two of your old, and otherwise worthless casings and make a double tread tire good for many thousands of miles additional service.

Prices \$2 up

Send for our price list today.

DOUBLE SEWED TIRE CO.

1415 Hennepin Ave., Minneapolis, Minn.

NEW DOUBLE TREAD TIRES

Good for 2,500 to 10,000 Miles Service

From Your Old Worn Casings

\$2 to \$4.75

LOWEST PRICES QUOTED ANYWHERE

Send us 2 old tires you were going to junk—1 with perfect beads, the other with fair tread. The new tire we make from them will give you 2,500 to 10,000 miles service.

| | | | |
|-----------------|--------|---------------|--------|
| 30x3..... | \$2.00 | 35x4 1/2..... | \$3.50 |
| 30x3 1/2..... | 2.50 | 36x4 1/2..... | 3.75 |
| 32x3 1/2..... | 2.65 | 36x5..... | 4.00 |
| 34x3 1/2..... | 2.75 | 37x5..... | 4.25 |
| 33x4, 34x4..... | 3.00 | 38x8..... | 4.75 |

LAFAYETTE TIRE CO.

511-513 N. 9th St. Lafayette, Indiana

NOVEMBER SALE

We are in a position to offer one of the largest stocks of seconds and demonstrating tires at prices that are unequaled during the regular tire season. If you are in the market for a tire you can save money by investigating a few of the prices listed below:

| Size | Tires | Tubes | Size | Tires | Tubes |
|---------------|--------|--------|---------------|--------|--------|
| 30x3..... | \$3.00 | \$1.25 | 36x3 1/2..... | \$6.75 | \$1.70 |
| 30x3 1/2..... | 3.75 | 1.35 | 34x4..... | 6.75 | 1.50 |
| 30x4..... | 4.25 | 1.35 | 32x4 1/2..... | 6.00 | 1.50 |
| 32x3 1/2..... | 4.50 | 1.40 | 36x4..... | 6.75 | 1.75 |
| 31x4..... | 4.25 | 1.40 | 35x5..... | 7.50 | 1.85 |
| 32x4..... | 6.00 | 1.50 | 36x4 1/2..... | 7.25 | 1.85 |
| 35x4..... | 6.50 | 1.60 | 37x4 1/2..... | 8.25 | 1.85 |
| 33x4..... | 6.25 | 1.50 | 36x5..... | 8.25 | 1.90 |
| 34x4 1/2..... | 7.00 | 1.60 | 37x5..... | 8.50 | 2.00 |

We require \$1.00 on all mail orders to defray express charges. All shipments made promptly, subject to inspection.

AUTO SALES & PARTS

1429 S. State St. Chicago, Ill.

RECLAIMED TIRES

SAVE MONEY ON YOUR NEXT TIRE BILL By Sending Us 2 Old Tires

We take two tires, one which is road-worn, but has good beads, and another which is rim-cut but has good tread and lock the side walls by our own special process, making a double tread tire good for thousands of miles.

PUNCTURE-PROOF and WATER-PROOF

Our Special Process Stays

We ship C. O. D. subject to examination at the following prices:

| SIZE | If You Furnish Both Casings | 33x4..... | 4.00 |
|---------------|-----------------------------|---------------|------|
| 30x3..... | \$2.75 | 35x4 3/4..... | 4.25 |
| 32x3..... | 2.75 | 36x4 3/4..... | 4.50 |
| 30x3 1/2..... | 3.00 | 38x4 3/4..... | 4.75 |
| 32x3 1/2..... | 3.00 | 37x4 1/2..... | 5.00 |
| 34x3 1/2..... | 3.25 | 38x4 1/2..... | 5.25 |
| 36x3 1/2..... | 3.50 | 40x4 1/2..... | 5.50 |
| 31x4 3/4..... | 3.75 | 36x5 3/4..... | 5.50 |

Small additional charges when inner shoes are required. Send us your old tires.

THE GEORGE R. CARTER CO.

Connersville, Indiana

SAVE YOUR OLD TIRES

Send us 2 OLD TIRES, one with a good bead and the other with a good tread, and WE WILL COMBINE them by our DOUBLE TREAD SYSTEM into a SOUND ONE for a cost of from \$2 to \$4, according to size.

If you have ONLY ONE tire in this shape we can FURNISH you with the OTHER ONE for a cost from \$4 to \$9. If you have NO OLD TIRES to have remade you can ORDER READY REMADE ones that we carry in stock from \$4 to \$12. POSNER & BLOCK
1211 Bedford Ave. Brooklyn, N. Y.

The Clearing House—continued.

TIRES—TUBES

These are positively First Tires and Fresh Stock

| | | |
|--------------------|-----------------|--------------------|
| 30x3....\$ 6.00 | 31x4....\$12.00 | 36x4....\$14.00 |
| 30x3 1/2.... 7.50 | 32x4.... 12.50 | 35x4 1/2.... 17.00 |
| 32x3 1/2.... 8.50 | 33x4.... 13.00 | 37x4 1/2.... 18.00 |
| 34x3 1/2.... 10.25 | 34x4.... 13.50 | 36x4 1/2.... 17.25 |
| 30x4.... 11.25 | 35x4.... 13.50 | 37x5.... 20.00 |

For Non-Skid add 10% to above prices
Special Bargains in Slightly Used Tires

| | | |
|-------------------|-------------------|--------------------|
| 30x3....\$3.00 | 31x4....\$5.00 | 36x3 1/2....\$7.00 |
| 31x3 1/2.... 4.00 | 32x4.... 6.50 | 34x4.... 7.00 |
| 30x3 1/2.... 4.00 | 35x4.... 6.75 | 36x4.... 7.00 |
| 30x4.... 5.00 | 33x4.... 6.75 | 36x5.... 8.00 |
| 32x3 1/2.... 5.00 | 34x4 1/2.... 7.50 | 36x4 1/2.... 7.50 |
| 32x4.... 5.50 | 37x4 1/2.... 8.50 | 37x5.... 8.50 |

All goods shipped C. O. D., subject to examination, on receipt of 10 per cent of order.

TIRE REPAIR & SUPPLY CO.
1463 Michigan Av. Chicago, Ill.

TIRES

WE SELL
Akron Tires

Everybody knows what AKRON TIRES are—they have used them for years. No argument necessary.

Largest Stock; Lowest Prices

| Size | Plain Tubes | Size | Plain Tubes |
|-------------------|-------------|--------------------|-------------|
| 28x3....\$5.00 | \$1.80 | 34x4....\$9.00 | \$3.20 |
| 30x3.... 5.00 | 1.90 | 35x4.... 10.00 | 3.30 |
| 30x3 1/2.... 6.50 | 2.15 | 36x4.... 10.00 | 3.35 |
| 32x3 1/2.... 7.50 | 2.25 | 35x4 1/2.... 12.50 | 4.00 |
| 34x3 1/2.... 8.00 | 2.35 | 35x4 1/2.... 12.50 | 4.10 |
| 31x4.... 8.75 | 2.95 | 36x4 1/2.... 13.50 | 4.15 |
| 32x4.... 8.50 | 3.05 | 37x4 1/2.... 14.00 | 4.25 |
| 33x4.... 9.00 | 3.10 | 36x5.... 15.00 | 4.95 |
| | | 37x5.... 16.00 | 5.05 |

Non-Skids \$1.00 Extra; All Sizes

In orders of four or more tires where cash accompanies order in full we pay transportation charges. For less in number we agree to pay one-half of charges.

10% required on C. O. D. orders

AKRON TIRE CO., Inc.
Authorized Capital, \$300,000.00
1789 Broadway, Corner of 58th St.
NEW YORK

SAVE MONEY

Send us your discarded tires. We make them over at a cost that is about half the rate you pay using new tires.

WILCOX BROS.

3019 Michigan Ave. Chicago

SAVE YOUR OLD TIRES

Good for 3,000 to 4,000 Miles

We take two of your old tires and rebuild them into one tire good for several thousand miles. Do not confuse this process with the "sewed-on" or "half-soled" tread being put out by many vulcanizers. With our TWO-IN-ONE PROCESS the tire has the appearance of any other casing after being put on wheel. Many users are now getting excellent service from discarded tires. Why not you?

| Our Prices | |
|--------------------|--------------------|
| 30x3.....\$2.50 | 34x4.....\$3.75 |
| 30x3 1/2..... 2.75 | 35x4..... 3.75 |
| 31x3 1/2..... 2.75 | 36x4..... 4.00 |
| 32x3 1/2..... 2.75 | 34x4 1/2..... 4.00 |
| 34x3 1/2..... 3.00 | 36x4 1/2..... 4.25 |
| 31x4..... 3.00 | 35x4 1/2..... 4.50 |
| 32x4..... 3.25 | 36x5..... 4.75 |
| 33x4..... 3.50 | 37x5..... 5.00 |

Small additional charges for necessary repairing. Send no money, but send us two old tires for a trial order today.

INTER-STATE TIRE REPAIR SHOP
Bethany, Missouri

WELDING

AAA WHY WELD???

When you can do better work in one-fourth the time—at one-fourth the price, by using the latest great discovery

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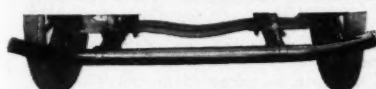
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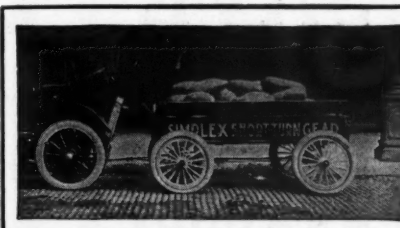


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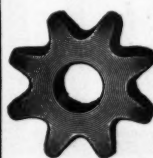
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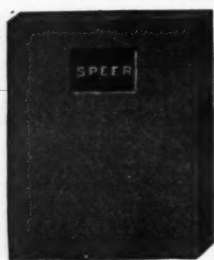
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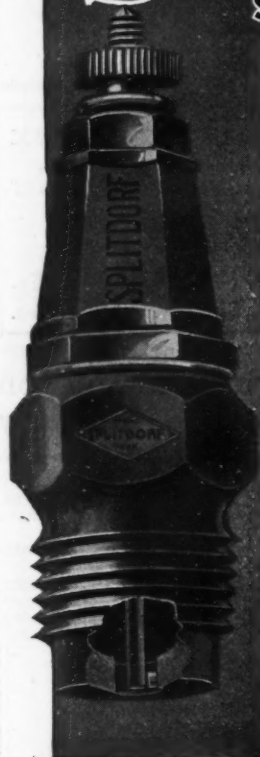
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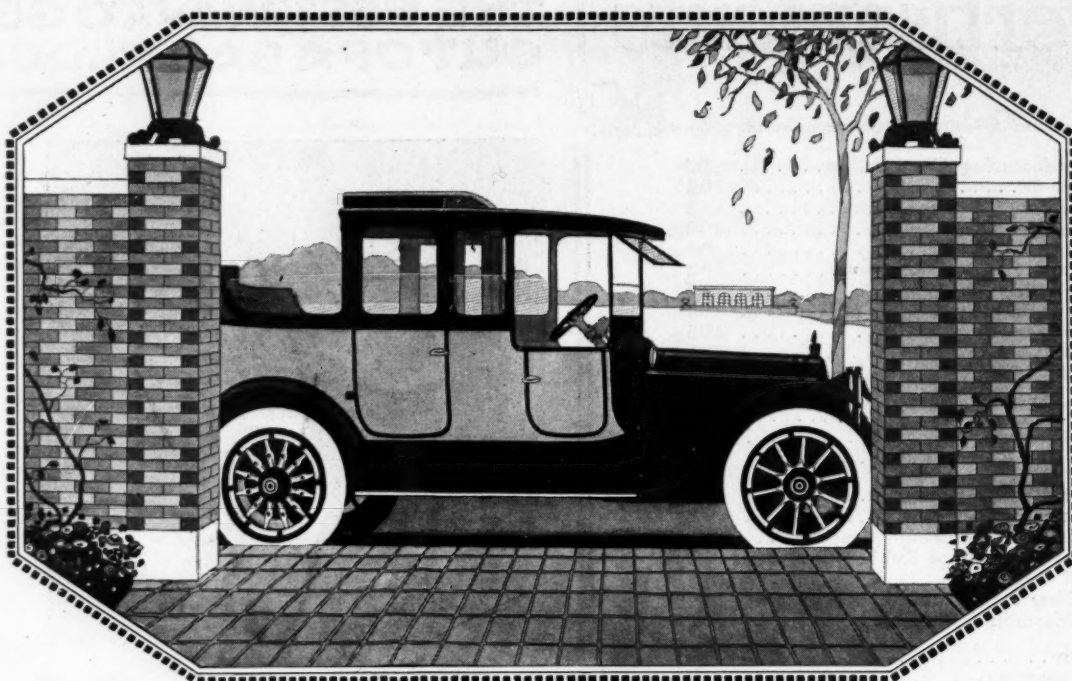
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